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MAJOR EDWIN HOWARD ARMSTRONG

M.I.E.E.

Chevalier of the Legion of Honour

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Major Edwin Howard Armstrong

CHEVALIER OF THE LEGION OF HONOUR

MAJOR EDWIN H. ARMSTRONG is a comparatively young man, but there is probably no other single individual who has accomplished so much in the radio field.

He was born in America on December 18th., 1890. He became interested in radio whilst a high-school student, and had a receiving set in his bedroom, where he carried on his early experiments.

In those days there were no three-element valves, and the Fleming two-element valve was deemed to be a wonderful thing.

In 1911 Armstrong secured an "audion," the three-element valve made by Dr. Lee De Forest. In experimenting with this valve he endeavored to increase the sensitiveness of his receiver.

He had made a special study of the technical side of radio, and of the action of the audion valve. Every available book on the subject was eagerly studied, and in the early part of 1912, it occurred to him to tune the plate circuit. Later in the year, he carried on experiments in tuning the plate circuit, and he noticed that the signals became very much louder, but that presently they became distorted, and then disappeared altogether. The point just before the hissing commenced, Armstrong found was where the signals came in loudest. At this time he was 22 years old.

He continued to experiment in New York, trying to understand the action of the apparatus, and in February, 1913, he thought that he had found an explanation.

It was not easy for him to convince his friends that he had made a discovery of importance. He was advised by an uncle, however, to have a copy of his circuit diagram witnessed by a notary public. This was done and afterwards proved to be a most important document, figuring prominently in several law suits in which Armstrong was involved.

Not satisfied with one important discovery, Armstrong worked on and conceived and constructed the "super-heterodyne" receiver, whilst an officer in the American Army Signal Corps. By means of this new type of receiver, it was possible for him to pick up signals from low-power German trench sets which were sending out confidential matter, with a small loop on the front-line trenches. For the valuable work which he did, he was promoted to the rank of Major, and made Chevalier of the Legion of Honour.

Upon his return from the war, he commenced experimenting again, and was imbued with the idea that something better than regeneration could be discovered. He had noticed that amplification of signal strength increased up to a certain point and then became raspy, and finally the signals became almost undistinguishable. He reasoned that if it were possible to get beyond that point without getting the hissing sound, amplification would be infinite. The results of these experiments were made known in his famous paper on "Super-regeneration," read before the Institute of Radio Engineers in June, 1922.

Major Armstrong has been for many years associated with the Institute of Radio Engineers. He was President of the Radio Club of America. At present he is a professor at Columbia University, New York, from which he graduated in 1913 with the degree of Electrical Engineer.

He is one of the few radio engineers who have risen from the ranks of the radio amateurs. He is still a radio amateur at heart, as his interest in the Trans-Atlantic tests show.

Editorial

THE PLAIN DUTY OF THE NEW FEDERAL GOVERNMENT

The people demanded and have succeeded in obtaining, a frequent opportunity of reviewing the actions of the legislators whom they appoint to carry on the affairs of the country. Elections take place in order that electors may express their approval or disapproval of the manner in which the business of government has been carried on. Each newly-elected Parliament is charged by the people with the duty of reviewing the work of their predecessors in office. If wrong has been committed, it must be righted. If anything has been done in the name of the people, which is detrimental to the interests of the people as a whole, it must be undone, in order that they may be relieved of any onerous burden placed upon their shoulders, by the error of judgment of their legislators.

In connection with a scheme of wireless communication throughout the Empire, the late Federal Government, committed the egregious error of entering into an arrangement with a private company for the erection and maintenance of a powerful wireless station. The Australian taxpayer will have to find half a million of money for the project, without any adequate check or control on the manner in which that money will be expended. We say "without adequate check or control" advisedly, as by no stretch of imagination can the placing of Government representatives on the directorate of a private company be construed as being an adequate check on the expenditure of public money.

The essence of the Empire Wireless Scheme is to provide a means of maintaining defence communication in time of war. The Australian Wireless Station is to be our **dernier resort** for war communication purposes, and yet the legislators of the late Federal Parliament saw fit to place this highly important defence matter in the hands of a private company, a company which has its ramifications throughout the civilised world, and which, in time of peril, may be operating wireless concessions in a country with which we may be at war.

In such a case, which country will the company serve?

Neither a man nor a company can serve two masters, and no greater iniquity has ever been committed in Australia, than to place the defence communications wireless station under the control of a private company.

It is the plain duty of the new Federal Government to institute a thorough and searching enquiry into this action of the late Government. A Royal Commission should be immediately set up to ascertain why a private company was allowed to be placed in control of Australia's contribution to an Empire Defence Scheme, and as the result of that Commission's deliberations, the iniquitous agreement entered into by the late Government with the company should be annulled.

For what reason was this concession given to a private concern?

The Postmaster-General's Department has its own competent engineers, second to none in the world, and ready, able, and willing to carry out any work entrusted to them.

It could not be a question of patents, as under the Patents Act 1903-1909, clause 92, "a Minister of the Crown administering any department of the Public Service, whether of the Commonwealth or a State, may use an invention for the Public Service on such terms as are agreed upon with the patentee, or in default of agreement, on such terms as are settled by arbitration in the manner prescribed."

Obviously, it was neither a question of engineering, nor of patents, and we are left at a loss to understand why such an important concession was given to a private company.

In the name of the Australian people we ask the new Federal Parliament to lose no time in probing this matter to the bottom, and to see to it that our means of defence communications are kept under the sole control of the people of Australia.

REGARDING PATENTS.

In our last issue we pointed out that as the Lodge Loading Coil Patent and the Marconi Four Circuit Tuning Patent have expired, anyone is now free to manufacture and sell any kind of tuning device. We pointed out that the principle of regeneration could not be employed in a receiving set without applying for a license to manufacture to Major Edwin H. Armstrong, or his attorneys, whose New York address we furnished.

We have now obtained a copy of the Patents Act 1903-1909, and amendments, together with the Regulations, and also a copy of Major Armstrong's Patent. The application for the Patent was dated September 25th, 1916, and Claim 1 of the complete specification very effectively covers the principle of regeneration applied to any kind of circuit, that is, either a transmission or reception circuit. In February, 1915, Major Armstrong complied with that section of the American Patent Laws which required him to have a copy of his regenerative circuit diagram witnessed by a notary public. Later in the year, October, to be exact, the first patent was taken out.

Major Armstrong has emerged successfully from several lawsuits, and it is beyond question that his regenerative patent is the only valid one in existence to-day.

As we have pointed out, the Armstrong Patent was applied for on 25th September, 1916, and since that time the patentee has made no effort to manufacture apparatus on the lines of his patent in this country.

Under the Commonwealth Patents Act "any person interested may after the expiration of two years from the granting of a patent present a petition to the Patents Commissioner alleging that the reasonable requirements of the public with respect to a patented invention have not been satisfied, and praying for the grant of a compulsory license," etc.

The fee payable on applying for a compulsory license is £3, and special forms of application are obtainable at the Patents Office, Commonwealth Bank Buildings, Martin Place, Sydney.

The grounds on which a compulsory license may be claimed are as follows:—

"(a) If by reason of the default of the patentee—

(I.) to manufacture to an adequate extent, and supply on reasonable terms, the patented article, or any parts thereof which are necessary for its efficient working, or,

(II.) to carry on the patented process to an adequate extent, or,

(III.) to grant licenses on reasonable terms,

any existing trade or industry, or the establishment of any new trade or industry, in Australia, is unfairly prejudiced, or the demand for the patented article or the article produced by the patented process is not reasonably met, or,

(b) If any trade or industry in Australia is unfairly prejudiced by the conditions attached by the patentee to the purchase, hire, or use of the patented article, or to the using or working of the patented process."

The trade or industry of manufacturing radio apparatus in Australia is unfairly prejudiced, and will remain unfairly prejudiced until either voluntary licenses are granted by the patentee of the representative circuit, or until the Commonwealth Patents Commissioner grants compulsory licenses, and a Patents Commissioner can-not, of course, grant compulsory licenses until they are applied for.

All the intending manufacturer of radio apparatus needs to do is to apply immediately for a compulsory license under section 87 of the Act, offering to pay, say, 10 per cent. of the selling price of the apparatus by way of royalty. In our opinion, an applicant for a compulsory license to manufacture would be perfectly safe in going ahead with the production of radio apparatus, as, on account of the patent not having been worked for over six years (1916 to 1923) the patentee must either grant a voluntary license or be compelled to grant one under the provisions of our Australian Act.

We would make it quite clear that no person, firm or company in Australia has any control of the Armstrong Patent. The sole controllers of the patent are the attorneys whose name and address were given in the February number of the Review.

Section 123 of the Patents Act 1903-1909 is a very important one, from the point of view of those on whom any bluffing tactics may be tried. The section reads—"It shall be the duty of all patentees and their assigns and legal representatives and of all persons making or vending any patented article for or under them to give sufficient notice to the public that the same is patented EITHER BY FIXING THEREON THE WORD 'PATENTED' TOGETHER WITH THE DAY AND YEAR THE PATENT WAS GRANTED AND THE NUMBER OF THE PATENT; or when, from the character of the article this cannot be done, by fixing to it or to the package wherein one or more of them is enclosed a label containing the like notice; and in any suit for infringement by the party failing to so mark no damages shall be recovered by the plaintiff, except on proof that the defendant was duly notified of the infringement, and continued after such notice to make, use, or vend the article so patented."

To be of any legal value a notification of infringement would have to be in writing, and the number of the patent, with the day and year the patent was granted, would have to be stated in such written communication.

Section 91A provides that "where any person claiming to be the patentee of an invention, by circulars, advertisements, or OTHERWISE, threatens any other person with any legal proceedings or liability in respect of any alleged infringement of the patent, any person aggrieved thereby may bring an action against him, and may obtain an injunction against the continuance of such threats, and may recover such damages (if any) as he has sustained thereby if the alleged infringement to which the threats related was not in fact an infringement of any legal rights of the person making such threats."

From the foregoing, it is clear that nothing stands in the way of a radio manufacturing industry being started in Australia, the tuning portion of a receiver or transmitter is now free to all on account of the patents having expired, and we have in our own laws the means to acquire the right to manufacture receivers and transmitters employing the feedback system.

If any patents bluff whisper is heard, demand notification in writing of the precise nature of the infringement claimed, with a statement of the day, date and number of the patent. Make your demand in writing for proper notification.

The latest news of expiring patents is that of the Fleming two-electrode valve.

As is well-known, the De Forest three-electrode valve was held by the Court to be an infringement of the Fleming Valve.

Now that the Fleming Valve patent has expired anyone is free to manufacture, sell or use for amateur experimental purposes or any other purpose any kind of a valve used in radio reception or transmission.

Movie Films and Broadcasting

For some time past, experiments have been conducted in photographing sound, so that the actors on picture films may be heard speaking at the same time as they are seen.

Many devices for this purpose have been placed upon the market from time to time, but their chief disability has been lack of perfect synchronisation, and, one by one, they have fallen into disuse.

Dr. Lee De Forest is said to have succeeded in photographing sound, and an Australian has met with a fair measure of success, but news now comes to hand of an entirely successful method of recording sound on films by means of special mechanism, invented by Mr. C. A. Hoxie, radio research engineer of the General Electric Company, Schenectady, New York, U.S.A. This new device is called the Palla Photo Phone, "palla photo" being Greek words meaning "shaking light."

The recording mechanism is purely mechanical, not electrical. The main feature of the recording apparatus is something akin to the laboratory mirror galvanometer. There is a tiny mirror, not much larger than a pin's head, on which is reflected a beam of light. The mirror is attached to a very delicately adjusted vibrating diaphragm. When sound waves impinge upon the diaphragm it vibrates and the mirror moves with it. The moving ray of light falls upon a strip of photographic film which passes in front of the beam, in continuous motion. On development the film shows a number of up and down markings on a perfectly clear background. These markings represent the oscillations of the reflected beam of light.

The film record of sound is the most faithful yet produced.

The tiny mirror and diaphragm are so small and their inertia so negligible, that the finest of tones, and the infinite shadings of speech are as faithfully recorded as the heavier tones and nuances, consequently, the characteristics of different voices are reproduced with uncanny fidelity.

The reproduction device is an entirely separate piece of apparatus. It is electrical in its operation. The record film is wound on a reel, just as a movie film is wound, and it passes in front of a very sensitive electrical apparatus, which consists of an ingenious arrangement of valves. This apparatus responds to variations in light falling upon it with instantaneous speed, practically as fast as the speed of electrical waves.

In consequence of this, an electric current is varied in such a way that it is practically identical with the vibrations of the original sound waves, and gives an exact reproduction of those waves. The varying electric current is then made to actuate a telephone, a loud speaker, or it can be used to operate broadcasting apparatus without the use of a microphone or any other pick-up device. This is what constitutes it a most valuable addition to radio science. Whole operas, such as "Aida," are now being broadcasted in the United States of America and the Pallaphotophone makes it possible for a record to be taken of a broadcasted opera, then a number of films can be sent out to Australia or any other country, and any number of broadcasting stations may send the film record out at the same time.

In this way the world's greatest singers may be brought to our doors, as it were. One has only to sit back for a moment and try to imagine the marvellous possibilities of this invention.

The world's orchestras, bands, instrumentalists, vocalists, lecturers, public speakers, Italian, French,

M. A. Hoxie, Inventor of the Palla Photo Phone

German, English and American grand opera—all brought to our shores on Pallaphotophone films, and broadcasted from every town in Australasia! It promises to be as great a business as the picture film business!

Nor should we imagine that we will get a merely super-gramophone effect in this Pallaphotophone broadcasting. The voice is so natural, that on tests recently conducted, it was impossible to know when the speaker was talking or when his recorded voice was being sent from the broadcasting station.

The result is absolute perfection, no distortion, no scratching of gramophone needles, nothing but true reproduction of original sound. No waiting for the gramophone to be wound up.

A Valve that works on Alternating Current

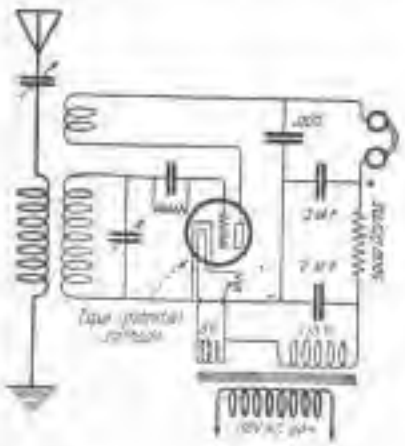
IT is only in the experimental stage, it is true, and it is not known when it will be available commercially, but a valve has actually been manufactured that takes its current for both filament and plate direct from the a.c. lines.

The only apparent difference between the new valve and the ordinary three-element valve is that the filament is enclosed in a kind of metal thimble. The thimble and the filament constitute a two element valve in themselves, and are used as such to rectify the A.C. into D.C. for the plate voltage. The three-element portion of the valve is made up of the thimble, the grid and the plate. The valve is supplied with current by a transformer having two windings, one delivering 5 volts for the filament, and another providing 200 volts for the plate.

The heated filament in turn heats the thimble, rendering the latter an equi-potential cathode, that is that every point on the cathode is at the same voltage, so that connecting it to the grid circuit will not cause any fluctuations in the grid voltage.

The thimble or cathode is coated with barium oxide, and in operation it becomes heated to a dull red, in which condition it gives off a copious stream of electrons. For the purpose of amplification and at the same time functions as the plate of a valve rectifier, the filament inside acting as the rectifier filament.

It is stated that the detection efficiency is about 10 times as high as in a certain standard valve, and that it gives four to five times the amplification. Not only are very high audio-frequency amplifications obtained, but it also seems to solve the problem of a good radio frequency amplifier. Using resistance coupling on 300 metres, voltage amplifications of 8 are easily obtained, and 150 to 600 metres, voltage amplification of 12 to 15 are common. In many cases a voltage amplification of 30 times at 360 metres has been obtained, and this with resistance coupling—the most inefficient form of amplifier. A single radio frequency valve, using a good radio frequency transformer, will be better than four or five stage with existing valve. It will be far superior to a super-heterodyne with present-day valves.



Regarding its performance as a detector, it is stated that it gives at least ten times as loud reception as a present-day valve. The importance of this is pointed out in that when distant stations are being received the signals are usually of the same magnitude as the valve noises, and therefore cannot be distinguished. In the new valve the valve noises are practically the same, but the desired signal will be many times louder.

The first question that occurs to one is "What about the hum?"

Of course, a filter circuit is included in the wiring diagram consisting of a 1 Henry choke and two, 2 mfd. condensers. With the filter in circuit it is claimed that with a single valve, the hum cannot be heard at all. With a detector and one stage of audio-frequency the hum can only be heard when the telephones are pressed close to the ears. With two audio stages, it is very noticeable but still not objectionable. With several radio stages and a detector the hum cannot be heard.

In a two or three valve receiver separate transformer windings are used for each valve, but not separate transformers, as all the secondaries are wound on one primary.

In another variation of this type of valve the filament is heated direct from the lighting mains without any transformer. That is, that the filament lights up on the 110 volt a.c. current, just as an electric globe would do. The filament and thimble are used to rectify the a.c. and d.c. for the plate current supply, and the only additional apparatus needed with this valve is the filter, which consists of three 2-microfarad condensers and two 4,000 ohm resistances. With this valve the electric light wires were used as an aerial.

If all that is claimed for this valve is true, it is quite revolutionary in its action. No "A" or "B" batteries, no aerial, except the electric light line; and it furnishes many times the power in both detection and amplification.

The valve has been developed by Dr. Albert W. Hull, of the Research Laboratories of the General Electric Co. at Schenectady, N.Y., U.S.A. It is stated that it is still in the experimental stage, and is to be made the subject of further research and development work.

Broadcasting in South Africa

I HEAR that the Postmaster-General of the Union of South Africa has announced that the Government approves of the Post Office granting applications for licences for broadcasting services in various parts of the Union. Licences will soon be issued through the Post Office, but broadcasting stations are barred from circulating advertisement propaganda and handling commercial traffic. The transmitting stations will have fixed wave-lengths, and sufficient powers to operate successfully in whatever zones they are erected.

The regulations for transmitting and receiving will be very similar to the lines on which the English and American services are established.

The Trans-Pacific Tests

Some Suggestions by W. M. B. VEITCH, Technical Expert of the Magnavox Company

IN continuation of my article in the February number of the "Review," I may say that when using either direct or indirect magnetic coupling the greatest number of stages of amplification compatible with easy control is four. If more stages are used there is a marked tendency towards reaction. One of the disadvantages of transformer coupled amplifiers is the large number of adjustments which are necessary, especially if loose coupling is adopted in the inter-valve transformers as a means of minimising static and interference. To simplify the tuning of multi-stage amplifiers, it has been suggested that the moving portion of all the condensers should be joined together mechanically, and operated as one. Unless great care is taken in the mechanical and electrical construction, some difficulty will be experienced with this arrangement, and a better method would be to have each circuit carefully calibrated.

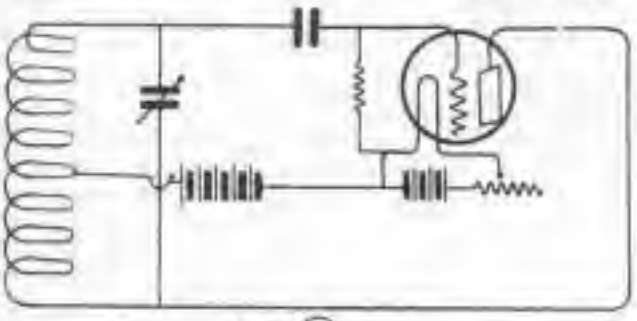


FIG. (1)

Before the test signals are transmitted local signals will be sent out to enable those attempting the reception to tune all their circuits. If provision is made for the insertion of the 'phones in the plate

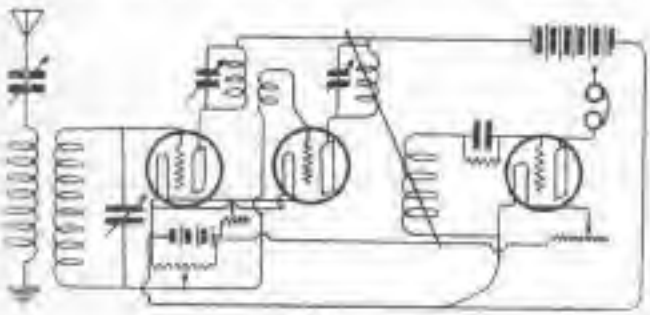


FIG. (2)

circuit of each valve successively, the tuning of each circuit would then be considerably simplified, for, by varying the potential on the grids of the high frequency amplifying valves rectification can be obtained on the strong local signals, and should reaction capacity coupling be used strong signals would be rectified by accumulative rectification. It may be found difficult if many stages of amplification are used to prevent self-oscillation, which may be due to electro-magnetic inductance between the coils, or to leakage of current, forming a resistance feed-back.

To prevent undesirable reaction, the grid of the valves may be made positive relative to the negative end of the filament.

The lowering of resistance from grid to filament of the valves will increase the decrement of the oscillating circuits, and thus will tend to stop reaction. Another remedial measure is to place a high resistance across one or all of the grid oscillatory circuits. The coupling of a portion of the plate inductance to one of the grid inductances in the reversed direction will also tend to prevent self-oscillation.

A suitable transformer for 200 meters may be made by turning a groove to 1¼in. diameter, in a piece of 1¾in. Ebonite rod, and winding a primary of 30 turns, over a secondary of 35 turns of No. 38 D.S.C. wire.

RESISTANCE COUPLED AMPLIFIERS.

The advantage of this type of amplifier is that no adjustments are required, and since there are no

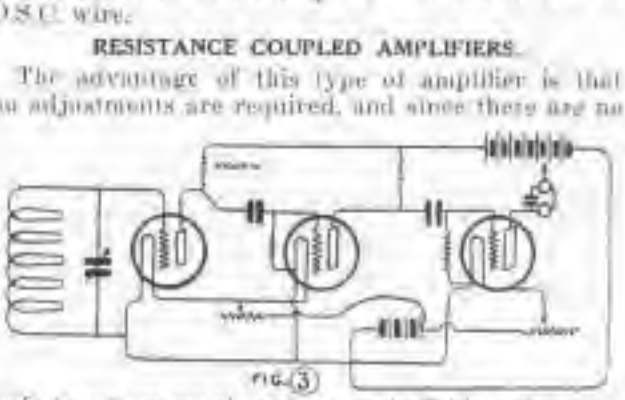


FIG. (3)

coils to set up an electro-magnetic field, self-oscillation can only occur when bad insulation allows a leakage of current. It is well known, of course, that this type of amplifier is not efficient on wave lengths below 1000 meters, and experimenters may be inclined to dismiss the idea of using resistance coupled amplifiers on account of this. Highly successful results have been attained, however, by producing beats in the first valve and altering the wave length so that it is of a suitable length to be amplified efficiently with a resistance coupled amplifier. Circuit No. 4, Fig. 4, indicates how this can be done, and the following figures will show clearly how waves may be produced, having a wave length suitable for amplification by means of a resistance coupled amplifier, and having a beat frequency so high that it will be inaudible.

The absolute limit of audibility is 14,000 vibrations per second.

Let the aerial circuit be tuned to a wave length of 200 meters and the heterodyne circuit to 202 meters.

In this case the beat frequency would be:—

$$\text{Wave Length } \Lambda = \frac{\text{Distance (D)}}{\text{Frequency (n)}}$$

$$\text{For 200 meter wave } n = \frac{D}{\Lambda}$$

$$= \frac{300,000,000}{200} = 1,500,000$$

$$\text{For 202 meter wave } n = \frac{D}{\Lambda}$$

$$= \frac{300,000,000}{202} = 1,485,000$$

Beat Frequency = 1,500,000 − 1,485,000 = 15,000 (inaudible)

Wave length corresponding to a frequency of 15,000:—

$$\Lambda = \frac{D}{n} = \frac{300,000,000}{15,000} =$$

20,000 meters, approximately.

Let the heterodyne now be tuned to 205 meters:—

$$n = \frac{300,000,000}{205} = 1,463,000$$

Beat frequency = 1,500,000 − 1,463,000 = 37,000

$$\text{Corresponding wave length} = \frac{300,000,000}{37,000}$$

= 8,108 meters.

From the foregoing it will be seen that by simply varying the capacity of the heterodyne condenser, the beat frequency and concomitantly the wave length, may be readily altered.

The oscillatory circuits "a" and "b" in Fig. 4 should be tuned to the wave length corresponding to the beats produced and the oscillatory circuit "c" (Fig. 4) should be variable in the vicinity of 200 meters.

The circuit shown in Fig. 4 would tend to radiate, and if this system is adopted the writer would strongly recommend the use of a one step transformer coupled amplifier, and instead of coupling the separate heterodyne directly to the aerial, to couple it to the secondary of the high frequency transformer.

After the amplitude of the aerial currents has been increased by the high frequency amplifier, it is necessary to produce beats of audible frequency. This may be done by the autodyne principle but better results will be obtained if a separate heterodyne is used. In the latter case, the plate circuit of the last high frequency amplifier may include a tuned oscillatory circuit coupled to a separate heterodyne. To increase the volume of signals after rectification, one or two stages of low frequency amplification may be used.

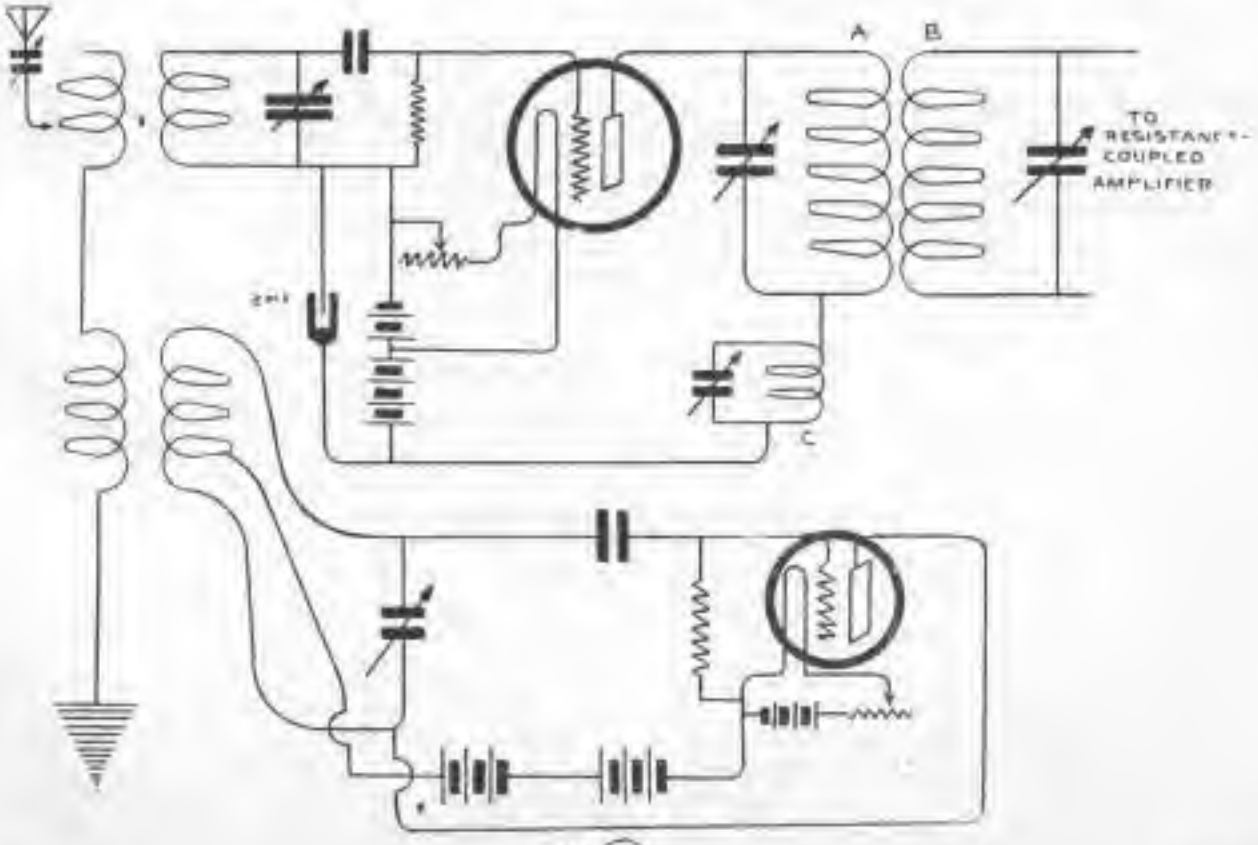


FIG. 4

The First Receiving Set on Tour

IN the United States it is a common, ordinary, every day sort of thing to see motor cars, furnished with loop or other aerials, and equipped with sensitive radio receiving sets. When a halt is called by the wayside for a snack of luncheon or tea, the set is coupled up and the party is entertained by radio concert, received from one of the large broadcasting stations.

It is a novelty, however, for a receiving set to be taken on tour in Australasia and it will be a month or so before radio concerts form part of the program of motor car tourists. In this, as in most other matters, someone with initiative and enterprise, had to make a start, and now that a receiving set has actually been on tour, it should not be long before the majority of touring parties will carry their radio outfit with them, as a matter of course.

In this case the initiative step has been taken by Mr. R. C. Marsden, President of the Metropolitan Radio Club, and Mr. J. M. Stanley, who recently started out on a week's tour of the South Coast and the Southern Tablelands in a Buick car, with a radio receiving set, carefully packed away amongst the baggage. Mrs. Marsden and Mrs. Stanley were included in the party.

The set was of the single valve variety, with the three honeycomb coil circuit, and using a Bariatron Detector. The filament current was supplied from the self-starting battery of the car.

Friday is a notoriously unlucky day, and as the tourists chose that day on which to make a start, it was not to be expected it would prove otherwise than a typical motorists' holiday—with its usual complement of blow-outs and punctures, two blow-outs and two punctures being the "bag" for the day.

However, like the Wise Virgins, the tourists had provided for eventualities, and the repair outfit enabled them to quickly remedy their little troubles—and Nowra was reached and the necessary accommodation secured for the night.

Here, the only available place to erect the aerial was the courtyard of the hotel. The aerial was a single wire, and the greatest height to which it could be taken was fifteen feet. The location was an exceptionally bad one, as the aerial was screened on all sides by stone buildings, which had iron roofs. Under these circumstances, it is not to be wondered at that signals came in but fairly, V.I.S. feeble, and some shipping a little better.

A photograph was taken of the aerial and location, but for some reason, it did not turn out a success.

An early start was made the next day for Batemans Bay. Here, at "Hill's Hotel," ideal conditions for putting up the aerial were found, a water tank tower of fair height providing anchorage for one end, and the top of a two-storey stable and garage gave good hold for the other end. The water tank tower is shown in the photos.

V.I.S. came in with remarkable clarity, as did V.J.M. V.J.A. and V.X.D. and other shipping came in, but heavy static made the signals unreadable.

Listening in was somewhat interrupted by an embryo experimenter, who had imbibed more well than wisely, and who persisted in forcing upon the party his limited knowledge of "this 'ere phonograph."

Leaving Batemans Bay behind, and making for Braidwood, Araluen Mountain suddenly loomed up, and for steepness of gradients, and hair-pin bends, was found to be the worst ever encountered.

At Braidwood, the gable of a stable, only nine feet high, was the sole means of fixing one end of the aerial, the other end being taken to the fence opposite. Excellent signals were heard, and a feeble carrier wave, apparently from Burwood Radio Club, came in, after which proceedings were closed for the night.

The next stage was on to Goulburn, where the best that could be done in the matter of an aerial was a single strand across the bedroom in the hotel. All that came in was heavy static, save an equally heavy landlord, who strongly objected to his place being strung up with wires. Some day hotel landlords will be more civilised and will not cavil at the efforts of scientists. They may even go so far as to advertise "Aerials Provided."

Bowral was the next stopping place, where two days were spent touring the district. Once again the aerial was erected in the courtyard of the hotel, but the only signals heard were from the experimenter's dear old friend, V.I.S.

In the heart of the Kangaroo Valley, the aerial was erected, two dead gum trees on either side of the road serving as "masts."

The earth, on that occasion, was a counterpoise in the form of a barbed wire fence. In spite of the excessive screening, in the form of trees and surrounding hills, very good results were obtained, in fact, quite as good as those on the top of the hill at the Fitzroy Falls, where another test was made, the closing experiment of the tour.

Taking into consideration the disadvantages under which the experiments were conducted, the results attained, with a one valve receiver, were very satisfactory, and Messrs. Marsden and Stanley are convinced that with a two or three valve receiver, constructed with a view to portability, it is quite practical to receive radio signals over long distances with a set carried in a touring motor car.

Broadcasting will shortly be in full swing, and there will be more opportunity to listen in, when the next receiving set is taken on a car tour.

With a loop aerial and sensitive receiving sets, such as are used on the American touring cars, radio concert and signals should be heard without much difficulty, and without the trouble of having to search for places to erect an aerial, or incurring the anger of finicky hotel landlords, who object to "having their place strung up with wires."

The First Receiving Set on Board

Incidents of the Trip

A Motorist's Holiday.

The Writer Tests Aerial Tower at Bill's Hotel, Bateman's Bay.

A J.S. "Listening In" at Bateman's Bay.

The Operating Room at Braidwood.

On the Road to Bateman's Bay.

The Good Gum Tree Aerial Made in Kangaroo Valley.

A J.M. "Listening In" in Kangaroo Valley.

After Mending Tyres a Little Refreshment Was Necessary.

The Fishing Was Good in the Kangaroo Valley. J.S. Makes a Fine Catch.

Wireless Pars from Everywhere

BROADCASTING IN SYDNEY, N.S.W.

ON February 2nd Messrs. Grace Bros., of the well-known departmental store, commenced a Radio Concert Broadcasting service, the transmission being done from what is called the Dining Room Furniture Palace, on one of the upper storeys. The studio has been equipped with a piano and pianola, and the best artists in Sydney have been engaged to sing. The Radio Concerts are sent out from three to four in the afternoons, and in addition, from eight to nine o'clock on Friday evenings.

The broadcasting was organised by Mr. F. L. G. Graf, who was assisted by Mr. W. G. Keogh and Mr. W. M. Veitch.

The singers are Madam John Carroll, Miss Ella Goodman, Countess Filipini, Miss Joan Elhalatans, and Maestro Fasati. Selections from "Madame Butterfly" and other operas have been rendered.

In the main departments, receiving sets are installed, and the concerts may be heard by visitors to the store.

Reports from Katoomba and Mosman Vale indicate that the radio concerts have been heard quite clearly at those places, and Messrs. Grace Bros. would like to have reports from experimenters at some distance from Sydney who have been successful in picking up the song and music.

The Firm is to be congratulated on its enterprise, especially in connection with having made a start with such high-grade concert items.

The names of the singers will assure the music-loving public that a feast of harmony awaits all those who secure receiving sets and "listen in."

* * *

A WEEKLY RADIOPHONE CONCERT FROM BRISBANE.

MR. L. O. KERLIN, of Secretary of the Queensland Wireless Institute at Brisbane, is at present in Sydney, and reports that a radio concert is sent out from the rooms of the Institute each Tuesday night, starting at 7.45 and finishing at 9.30. The transmitting set employs either four "Q" valves or a fire watt Radiotron. The wave length is 800 metres, and the energy radiated is 280 to 325 milliamperes.

Some Sydney amateurs have already heard those concerts, and others who do so should send a memo. along to the Secretary of the Institute at Brisbane to report how the concert comes in.

The s.s. Woollarra reports having heard the concerts when fifty miles south of Sydney, and the same vessel has heard them as far as 500 miles north of Brisbane. The wireless operator of the vessel says that the C.W. strength of the music was maximum.

It is worth noting that the Queensland Institute station was the first in Australasia to broadcast the results of an election.

At the last Federal Elections, in December, the election results broadcasted from Brisbane were heard quite plainly up to as far as 800 miles away.

* * *

DAME NELLIE MELBA "BROADCASTED."

RECENT cables brought the news that Dame Nellie Melba, appearing in "La Boheme," was heard over the greater portion of Britain, as the opera was broadcasted from the theatre as it was performed. It is to be regretted that the first broadcasting of our own Melba's voice should take place so far away from home, but as Dame Nellie Melba is to come to Australia shortly with an opera company picked from amongst the best singers of Europe, we will live in the hope that some enterprising firm in each centre will see to it that Australasian radio fans have the pleasure of listening to grand opera, with Dame Melba as the star artiste.

* * *

DIRECT WIRELESS COMMUNICATION WITH GREAT BRITAIN.

RECENTLY, Sir Joseph Cook, High Commissioner for Australia, complained of the delay of the Imperial Authorities in the matter of the direct wireless communication from Australia to Great Britain. The Melbourne "Age," of a later date, states that unnecessary has developed over the scheme, and suggests that some hitch has occurred. Let us hope so. Let us hope that the scheme will be held up until Australia awakens to the fact that such an important means of communication should not be hampered by private company control, but should be under the sole control and direction of our own Australian Radio Engineers.

* * *

A MONOPOLY IN WIRELESS WILL NOT BE TOLERATED IN AUSTRALIA.

SEVERAL meetings have taken place of wireless experts, who decided to form an Association for the best development of Australian Radio Science, and to protect the interests of radio traders and manufacturers by arranging with the Government and other authorities regarding the earliest issue of regulations which will best assist the advancement of wireless. To use every means to popularise the many advantages of radio science, with special reference to the early establishment of a broadcasting station, and to see that a fair field be allowed firms making or trading in radio apparatus, and that all contracts entered into by the Government or other public bodies be open to investigation, in order to prevent any monopoly which would hamper competition and development.

Mr. George A. Taylor was elected President of the Association, Mr. G. P. Mingay, Hon. Secretary; Mr. F. Basil Cooke, Hon. Treasurer.

A number of the leading Electrical Firms were represented, amongst them being The British General Electric Co. Ltd., The Western Electric Co., W. Harry Wiles and Co., Duretz Electric Co., Radio Company, New Systems Telephones Proprietary Ltd., G. and R. Electric Company, E. O'Sullivan Electrical Supplies and Engineering Co. Ltd., W. G. Watson and Co. Ltd.

ABOUT OURSELVES.

TELEPHONE conversation with Australia may become an accomplished fact in the new transmitter and receiver invented by Captain Alan J. Roberts, of Australia, justify the claims made for them. The transmitter consists of an entirely new type of microphone which aims at eliminating all the hearings that render long-distance telephoning a nerve-racking feat. All metallic contacts are removed. The microphone is a hollow glass container, with a central tube filled with Neon gas, and the sound passes through a thin cylindrical gap in the gas. Captain Roberts, who is known as the 'father of acoustics,' was in charge of the the wireless control of dirigibles, and was the inventor of a mysterious motor craft controlled by light and sound waves.

* * *

ADVERTISING AUSTRALIA BY RADIOPHONE.

ON Anniversary Day, a reception was held at Australia House, and Mr. Shepherd, secretary to the High Commissioner, had arranged with a broadcasting company to send out an "all Australian" programme of songs and speeches. Sir Joseph Cook was billed to speak for a quarter of an hour, the transmitter being of such power that he could be heard all over Europe.

Arrangements are being made to broadcast, once a month, or oftener, news regarding Australia.

* * *

TELEPHONING FROM NEW YORK TO LONDON.

EXPERIMENT with special transmitting apparatus has demonstrated the practical possibility of speaking from New York to London by radiophone. Questions were cabled from England and were replied to by radiophone from New York.

Sending apparatus is to be installed in England, so that complete conversations may be carried on, but it will be only by way of experiment, for the time being, as a great deal of research work must be carried out before the trans-ocean radiophone can be put to commercial use.

THE AMERICAN LABOR DEPARTMENT WILL BROADCAST.

THE activity in radio broadcasting by the Navy and Post Office Department for the Government, apparently has aroused a bit of jealousy in the Department of Labor. At any rate Secretary Davis has decided that the air was the proper medium through which to tell the world of the accomplishments of his department and so with the co-operation of the Navy Department, labor activities and news relative to arbitration, conciliation, employment, etc., will be put on the air.

Listening for Radio Flash.

SECRET WIRELESS.

THE "Chicago Tribune" (Paris edition) says Senator Marconi is perfecting a new invention in wireless telephony in the form of a machine for strictly private conversation.

"I am working on a device for sending messages directly between two points," he told the "Tribune" representative in Paris.

"The new apparatus eliminates all chance of outside parties listening in, and enables messages to be sent and delivered with absolute privacy.

"We are already able to send 100 miles. This winter I hope to perfect a device for a Trans-continental service."

Explaining the principle of the invention, he said:

"With an instrument built on the theory of a searchlight reflector, I am concentrating electric waves into beams that can be sent in a straight line in any direction. Up to the present we have had only a circular radiation of waves from a sending point.

DR. LANGMUIR'S INVENTION.

IT is not intended that Dr. Irving Langmuir's radiotrons shall immediately take the place of the Alexanderson generators in the high-power transmitting stations, but it is the present intention to link up the tubes with the alternators to make a more powerful station which shall be capable of hurling out stronger signals, and, ultimately, to cast the human voice to the far ends of the earth on waves of electric energy.

* * *

WIRELESS ON TANKS.

THE successful adaptation of the wireless telephone for use in tanks is announced by the U.S. Army Ordnance Department, which is about to give a demonstration of the new engines of war it has produced since the war.

As part of the programme a fleet of tanks will manoeuvre under the wireless orders of the commander in a flagship tank, and a tank machine-gun, firing armour-piercing bullets of ½-in. calibre, and an amphibious tank able to travel over land or through water will also be demonstrated.

Another new weapon is an anti-aircraft shell fitted with a fuse so sensitive that it will detonate its charge when the shell passes through the fabric of an aeroplane wing.

* * *

DENMARK REPORTS ICEBERGS BY RADIO.

AN iceberg reporting service has been established by radio in Denmark. Reports are broadcast whenever necessary by the coast station at Blaavand, at 12.20 and 10.20 p.m. These give the position, size and estimated course of such icebergs as have been observed in Danish waters.

* * *

PORTUGAL AND WIRELESS.

A "TIMES" message from Lisbon says that the Portuguese Parliament has approved a contract with the Marconi Company for the erection of wireless stations in Lisbon, Madeira, the Cape Verde Islands, Angola and Mozambique, to be ready in four years. A forty years' concession for working them will be granted to a syndicate with Portuguese capital and with a majority of Portuguese directors on the board.

FRENCH LESSONS BY WIRELESS.

ONE of the newest ideas for wireless is that lessons in French be sent by wireless telephone from French schools and broadcasted to pupils in English schools.

The idea was originated by a schoolmaster in Hastings, who, after listening-in to songs and speeches in French sent out by the Eiffel Tower, was so impressed with the clearness that he thought out a scheme for a valuable educational reformation.

The Eiffel Tower is one of the greatest of stations, and the schoolmaster's suggestion is that during school hours a short educational programme should be radiated across the Channel. He feels certain that this novel way of learning would be eagerly appreciated by his scholars. The Eiffel Tower authorities are considering the scheme, and there is every possibility that something may come of it.

If England could broadcast lessons in English to French scholars, a not impossible feat, then we shall have a really great achievement, for it will serve to forge a link between the younger generations of the two countries.

But there are many points to be settled before this scheme can be adopted, such as the consent of the Postmaster-General, the erection of receiving sets at various schools, the subjects to be taught, and many other minor considerations.

* * *

PAIN, GET THEE HENCE!

THE greatest substitute for laughing gas ever invented is the way dentists describe the very latest in radio devices.

The more disagreeable features of dentistry, the dizzy burr of the grinder, the sharp twinge of the probe, and other unpleasant things, are now relegated to the limbo of the past by means of a radio receiving set placed next to the dentist's chair.

Dentists claim that a little light music while teeth are being "fixed" helps greatly to relieve the pain and unpleasantness by taking the mind of the patient off his troubles. Anyway, it serves to lessen greatly the monotony of long, tedious hours in the dentist's chair.

NO LONGER AN ANXIOUS WAIT.

WHEN a sailor went to sea, his family used to spend many an anxious moment wondering whether he were in peril. Now this difficulty can be got over, and Captain C. A. Smith, commanding the Cunard liner Berengaria, is leading the way, for he has had a wireless receiving apparatus erected in his home at Kew, so that his wife can listen-in every day at noon and hear the great liner sending out her daily weather report.

* * *

A FAMOUS NOVELIST.

WILLIAM LE QUEUX, the famous novelist, is an ardent radio fan. He is a member of the Institute of Radio Engineers and has a wide knowledge of radio subjects. It is fifteen years since he started experimenting, and was one of the first to broadcast music.

Once, for nearly a year, his own profession was entirely neglected, in order to carry on long distance telephony experiments.

It is said that he holds the record for transmitting his voice on low power over 500 miles. He is very antagonistic to the reduction of wave length on which amateurs may transmit, and points out that at the lower wave lengths, the phenomena known as "fading" makes its presence felt whilst it is almost wholly absent on wave lengths of 1000 to 1500 metres.

ANOTHER STEP FORWARD.

TO Mr. W. D. Owen, of Jesmond Newcastle, we owe another step forward in the progress of wireless, for he has successfully applied the time switch to a receiving set. The switch, made by the Venner Time Switches, London, can be set so that it will switch on and off a set three times daily for any periods or for any scheduled signals.

At the moment he has set the apparatus to pick up the Eiffel Tower weather reports, and it automatically switches on when the signals start, and switches off when they come to an end.

* * *

RADIO SWINDLERS.

THE Vienna police recently discovered two Americans who had been swindling people on racecourses. Wireless played a big part in their modus operandi. One crook, who was also a wireless operator, backed a horse heavily about ten minutes after a race was over.

A Vienna bookmaker accepted the bet, believing that communication between Vienna and Paris was impossible excepting by telegraph, a message by the latter taking about four hours to get delivered.

By wireless, however, the swindlers did the trick.

The bookmaker became suspicious in the long run, and the two men were roped in by the police.

* * *

AN "UNPARALLELED EVENT."

FROM an East Pittsburg works, which was sending out a train-load of equipment for the electrification of the Chilean State Railways, a train was recently started by wireless.

"The president of the Westinghouse Company," says the "Radio Digest," of Chicago, "closed a switch on a pole near the railroad track on which the train was standing. The closing of this switch closed the radio electrical circuits, and this reaction released the controller, thus starting on the circuits in the locomotive the train—an event unparalleled in engineering history.

I think Major Phillips's experiments with wireless control have accomplished this feat.

The Armstrong Super-Regenerative Circuit

Article 2

A SLIGHTLY modified variation of the Armstrong Super-Regenerative Circuit, published in the last number of the Review is shown in Figure 1. The inductance "F" has been tapped at each 20 turns, and the condenser has been placed in series with the loop so that a loop of any size may be employed. Those who have made up the inductance according to last month's directions can easily tap it by scraping the covering off about 3-8 of an inch of the wire, tin it with a very hot iron, and then solder on a length of rubber-covered flexible wire. A rotary switch arm and half a dozen studs will be required to join the inductance and lead-off to.

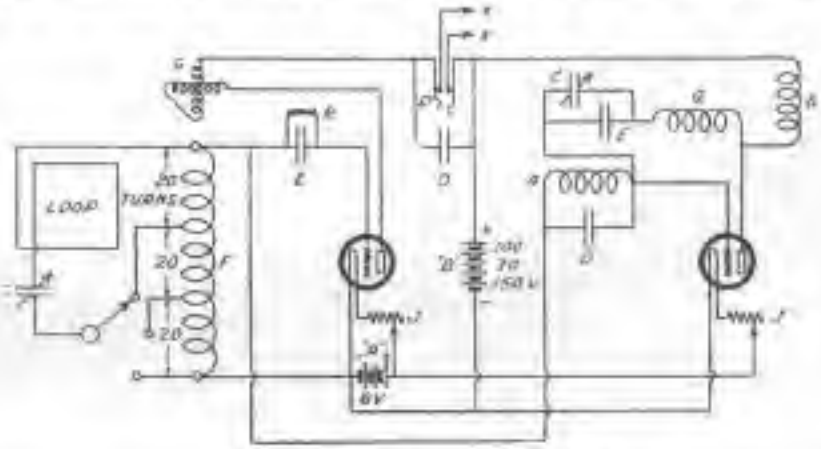


Fig. 1.—The Circuit somewhat Modified.

The writer has tapped at every ten turns, to make the inductance still more flexible, and has mounted a honeycomb coil holder to insert a honeycomb coil in series with the loop to provide for the longer wavelengths. As will be noted by the diagram, the "G" battery of the second valve may be eliminated, but it is best to experiment with this battery in, first, and then be guided by results. The "G" battery seems to be no disability, but a decided advantage. The first valve may be a Radiotron U.V. 201 or a Myers Audion, and the second valve a Moorhead amplifier or a Western Electric "J" valve.

It will be noted that only a two-valve circuit is set out.

To the two points marked "X" a one, two or three-stage audio-frequency amplifier may be joined. By tuning out the signals to some extent, so as not to hurt the ears, the two-valve circuit may be used with the headphones, or with a loud-speaker or without any amplifier. The signals with the two valves should be loud enough to fill a good-sized room, using a loop aerial.

To fill a larger hall an amplifier must be added. A one-stage amplifier will give signals heard all over the house; a two-stage will make them audible for a quarter of a mile or more, and a three-stage will give terrific amplification.

When a whistling effect is heard while tuning with the condensers or the variometer, success is near at hand, and it is a matter for becoming familiar with the adjustments to reach the goal.

An outdoor aerial may be joined on to the loop, but no changes are made in the circuit, and no earth connection is used. The addition of the outside aerial will bring in the distant stations louder, but will make no difference with the nearer ones.

The experimenter would act wisely if he thoroughly tried out the circuit of Figure 1 before attempting any other form of the super-regenerative circuit, as it has proved highly successful, and is as simple a circuit as can be devised to produce results.

If success is not attained immediately, some slight fault in making up the receiver should be looked for, as this is the most likely cause of the failure.

Although the experimenter is advised to adhere to the circuit of Figure 1, it is the opinion of the writer that it is always helpful to look over other circuits, and in Figure 2 is shown a two-valve circuit, differing in some respects from that of Figure 1.

In this circuit L3 and L2 are the primary and secondary of a vario-coupler, but the secondary is re-wound with 100 turns of a smaller wire, in one layer. C1 is a .0005 mfd. variable condenser, and C2 is one of .001 mfd. capacity. L3 is a 1250 turns duo-lateral coil, and L4 is one of 1500 turns. There is no choke coil ("Q" in Figure 1 circuit)

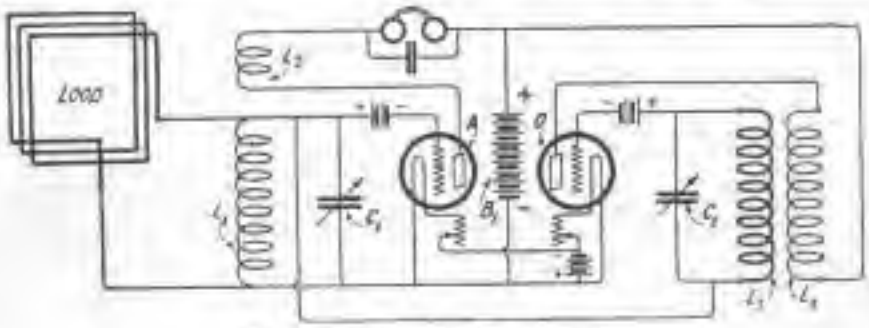


Fig. 2.—Another Two-Valve Circuit.

If the set does not work properly when finished, the connections should be carefully checked over, and then the connections of coils "F," "A," and "B" should be reversed, one at a time.

In Figure 2 the positive of the "A" battery is coupled to the negative of the "B" battery.

Figure 3 gives practically the same circuit as was used by Major Armstrong when he gave a demonstration to the Radio Club of America. There is one point of difference—the location of grid battery B3. By placing the grid battery in this position a negative potential is impressed on the grids of the first two valves, rendering the circuit more easy of manipulation and giving increased amplification. The potentiometer across the "A" battery provides a vernier control of the grid potential, and this control is very useful in finding the critical operating point.

C5, .005 mfd.; R1, R2, 12,000 ohms. each; C6, .005 mfd.; K1, 3 Henry iron-core choke; C7, .002 mfd.; T R., audio-frequency transformer; C8, .002 mfd. Five watt valves are used in this receiver, or any good hard amplifying valves.

Soft valves should never be used in a super-regenorsatlye circuit.

Batteries B1 and B2 are 100 volts each, the whole of the 200 volts being connected to the last valve. The grid battery B4 is 22 volts, and B3 is 7 volts.

One of the difficulties in experimenting with a circuit such as that of Figure 3 is that the 12,000 ohm. resistance and the Henry iron-core choke are not readily obtainable in Australasia. The condensers may be easily arranged. The .002 can be made by connecting together two ordinary fixed condensers of .001 capacity, a pair of small terminals, or a pair of small studs with a couple of nuts each, serving as connectors. C6 and C6 can be made up in a similar manner by coupling five .001 fixed condensers together.

The 12,000 ohm. resistance could be made with a little trouble, as Messrs. O. H. O'Brien & Nicholl, of 37-39 Pitt Street, Sydney, N.S.W., the firm handling Bakelite, also stock graphite suitable for the purpose. A good local firm should be able to supply the one Henry iron-core choke.

The tuning of a receiver having the circuit of Figure 3 may be helpful to readers that of Figure 1. In Figure 3, when the filaments are lit a high-pitched whistle should be heard. This whistle indicates that the second valve is oscillating. If the whistle is not present, the grid battery B4,

Mr. Nicholls & Major's Super-regenerative Receiver with the specially wound vario-coupler.

In Figure 3, L1, L2 is a vario-coupler, the secondary re-wound with 100 turns of fine wire. C1, .005 mfd.; L3, duo-lateral, 1250 turns; C2, .001 mfd.; C3, .002 mfd., C4, .001 mfd.; L4, duo-lateral, 350 turns; L5, duo-lateral, 1500 turns;

and the potentiometer, and the condenser C4 should be varied to produce oscillation.

When the whistle is obtained, the feed-back coil L2 and the condenser C1 are varied to produce oscillation of the first valve.

This point of oscillation will be easily recognised by the usual tests for oscillation. With the first and second valves oscillating, if the circuit has been correctly wired, a certain unmistakable effect will be noticed. If any of the variable elements of the circuit are changed, a series of heterodynes of harmonics will be heard. This indicates that the circuit is properly connected, although these harmonics will not be heard after the circuit is adjusted.

After this stage has been reached, the rest of the tuning is easy. The wave-length of the station to be received is tuned by the condenser across the loop, and by tapping the number of turns on the vario-coupler. Voice or music should be audible. Condensers C2 and C4 are now varied to obtain maximum amplification, and usually they need to be about their maximum capacity. A condition will be found where the whistles of the harmonics are no longer audible and the speech or music is received clearly. Final tuning of the grid battery and the potentiometer will find the critical point.

To test the super-regenerative receiver of Figure 1, the writer procured two pieces of maple, one half an inch thick, the other 5-16, and 12 inches long by 10 inches wide. The thick one was used for a base, and the thin panel was screwed to the base and supported by two four-inch brackets. The "P" inductance was made up and tapped. A variometer of the right type was procured at a Sydney dealer's. This was mounted on top of inductance "P" by four small brass brackets. Two angle pieces of brass served to bolt the inductance to the base. Two honeycomb coil holders were mounted on each side of the inductance, and the right angle was found to be when the long axis of the holders was run along a line at right angles to the top of the upright panel, the spacing being gauged so as to allow coils 1250 turns and 1500 turns to be just clear of the inductance when the coils were placed in position. The pins of both holders were placed uppermost.

Small pieces of wire thick enough to fill the mounting hole of the coil holders were soldered at right angles to the heads of small studs. This permitted the holders to be firmly bolted to the upright panel. To mount coil "Q" (200 turns) behind the inductance another coil holder was secured to the panel by studs, to the heads of which had been soldered wire of the correct shape to allow the holder to swing to the right position. On the base another coil holder was mounted to hold a honeycomb coil to load the loop to any degree. The valves were fixed to a small wood box, and the condensers were stood on the table beside the inductance panel. This is the best way to try out the circuit.

The photo is that of Mr. Rutledge B. Moyo, of New York, who has adopted a specially wound coupler

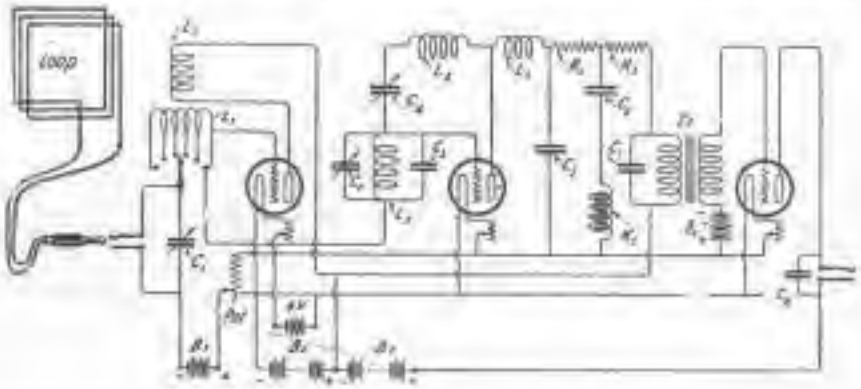


Fig. 1.—Major Armstrong's Demonstration Circuit.

(seen in the illustration) to overcome the "whistle" in the super-regenerative set, a trouble which has proved a very difficult one to overcome.

Many thousands of American amateurs are working hard to try to master the intricacies of the super-regenerative circuit, and it is to be hoped that Australasian amateurs will not lag behind in bringing the circuit into successful operation here.

How to Banish the Mosquito

WHEN mosquitoes disturb your slumber on a summer night, don't lie awake swatting and swearing, is the advice of a Western Electric engineer who asks that his name be withheld. Take the screen out of one window, open it wide and set an electric fan about six feet inside it, pointed out. The direct blast from the fan will draw a lot more air with it, so that there will be quite a breeze out through the open window. Any mosquito who comes anywhere near the draught will be drawn toward it, and if it gets into the stream it will be whisked outdoors. Once out, its motive power is too small to beat its way back against the artificial wind. Sooner or later any flying insect in the room will wander into the danger zone, so the room is emptied and kept free from the "slumber-stoppers." At the same time fresh air is drawn in through a screened open door or window.

This engineer got his idea from the vacuum-pump that is used to remove the last traces of air from vacuum tubes used in radio. Most of the air is pumped out mechanically, but a few molecules linger behind. So, the tube is connected to a sort of chimney up which is flowing a stream of heavy mercury molecules from a boiling pot of mercury below. The molecules of oxygen and nitrogen in the tube are flying hither and thither all the time and sooner or later each one of them will shoot down the connecting tube and into the chimney. Here it is caught in the mercury molecule stream, and as it is much lighter than them it is swept along with them. When delicate tests show that all the air molecules have left the tube, it is sealed off with a blowpipe flame.

How Wave Length is Controlled

THERE are many enthusiastic amateurs possessing simple or complex wireless sets who are fully aware that by altering the inductance, or turning the handle of a condenser, they can "cut out" certain stations, and at the same time render audible other signals previously unheard.

They are not so certain, however, as to why this variation of capacity and inductance produces the results mentioned above, and it is the purpose of this article to explain briefly and as non-technically as possible the reason.

We have already seen that the speed or velocity of wireless waves is a constant one, and if we therefore imagine that the first wave creates nine other waves in the space of one second, the ten waves will, as we know, cover a distance of 186,000 miles.

If we wish to find the length of one wave, it is obvious that we need only divide 186,000 by ten to find it, and each wave will be 18,600 miles long. The number of waves passing any given point in one second is known as "wave frequency."

A simple formula governing wave length can thus be deducted from the foregoing, namely, that the velocity will equal the length of the wave multiplied by its frequency, commonly shown as "Velocity = wave-length × frequency."

We have studied the manner in which the wave is generated, but obviously we must go beyond that, because we have to produce waves of different lengths. We know that the wave-length will not alter once the wave has been started, but the problem of determining the initial length still remains to be solved.

There are two factors contained in all wireless circuits by which the length of a radio or pressure wave is governed. These are Capacity and Inductance.

To try and understand these two qualities, we will deal with them separately, commencing with capacity. We all know that water, steam, or air can be so compressed into a limited space that considerable pressure will result on the interior walls of the receptacle containing such a compression, and it is easy to imagine what would happen if a hole were pierced in such a container.

Electricity can be stored in a similar manner in a condenser, reference to which has already been made. The difference between the amount of electricity a condenser will hold normally and that which can be forced into it by a continued application of electrical pressure, is known as its "capacity."

A pint of water pressed into a gallon jar would not affect the capacity of the jar for containing water, but if a pint of water is forced into a container which normally holds half a pint, a state of strain immediately becomes evident in the walls of the container.

The amount of electricity we can force into our foil plate of the condenser, therefore, depends upon the size of the plate. If we use more than one plate in a condenser, each plate adds to the sum of its capacity.

Condensers of large capacity are constructed upon the same principal as the Leyden jar. They are made by taking a number of sheets of tin foil, or brass, and in order to prevent actual contact between them, separating by sheets of glass or other insulating material. Alternate sheets of the foil are then connected together on either side.

As the storing properties possessed by the condenser depend upon interaction between the plates and the dielectric, or glass, its capacity can be varied by sliding the metal plates from between the glass sheets and vice versa. Obviously, a large condenser, when it discharges across the air gap, will cause a wave of a different length to that produced by a small condenser performing the same operation, and the length of the initial wave is therefore governed by the size of the condenser used to create it.

Let us now turn to inductance. Inductance in an electrical circuit is that quality which offers opposition to any change of the flow of current in a circuit. An inductance is formed by winding a wire, the gauge of which varies according to the functions the inductance has to perform, round an insulated former or tube. The resultant close spiral of wire, if connected in an electrical circuit will then possess the property of retarding any alteration of current value as mentioned above.

Inductance may be compared to "mechanical inertia," as a means of distinguishing it from the most unavoidable quality in an electric circuit, namely, resistance. When a motor car is started from a stationary position, a certain amount of energy is required to move it. Once it is moving, however, less energy will be required to keep it going at a uniform speed than was necessary to start it, and eventually, if we shut off the supply of energy altogether, the car will continue to move for some distance before coming to a standstill.

The opposition offered by the car in the first instance is due to its "inertia," and the difference between the energy required to move it, and that necessary to keep it moving, is given back when it is travelling "under its own momentum." Inductance possesses similar characteristics in so far as energy supplied to it in the form of electricity is not wasted but only retarded. What happens then, if we place such a coil of wire in the circuit through which our condenser is to be discharged. The current created, as we are aware, is continually altering in value, as it oscillates between the condenser plates, and, as we have just considered, it is this variation which the inductance opposes.

We might consider the inductance as acting like a brake upon the frequency or speed with which the current oscillates in the circuit. The more induc-

Wireless Terms

EARTH.—An essential part of an aerial system. Such a system consists of two parts, the aerial wire and the earth wire, the two forming a condenser (to be defined later), which is charged (in the case of a transmitting station) to a high voltage in order to set in motion waves in the ether, and, in the case of a receiving station, receive the waves. The earth usually consists of a network of wires or metal plates buried in the earth and connected together. In the case of an amateur station, a suitable earth may be obtained by connection to a water-pipe or an earth pin driven in the ground.

On ships one is made of the iron hull of the vessel.

* * *

PRIMARY.—That part of a loose coupler which contains the thicker wire. It is usually the outside tube and is directly connected to the aerial, earth, variable condenser, and in some valve receiving circuits to the grid of the valve. It is made variable by means of a slider or switch. The term also refers to the input winding of transformers, induction coils and similar instruments. The gauge of wire used for the primary winding depends upon the gauge to be used for the secondary and the purpose the instrument is to serve.

SECONDARY.—The inner wire-wound tube that slides inside the primary of a loose coupler. It is usually wound with finer wire, and has a switch fitted at the end. It is connected in the crystal and telephone circuit of a crystal receiver, and is used as a reaction coil in some simple valve circuits. The term also refers to the output winding of transformers, induction coils, etc. Sometimes the windings of primary and secondary are very close together, at others they are a considerable distance apart. An instance of the former is the modern high-frequency transformer used in wireless, where both windings are wound together. In referring to the ratio of transformers, the terms 1 to 5 or 1 to 10 are used, indicating that the secondary has 5 turns to 1 of the primary or 10 to 1 as the case may be.

* * *

LOOSE COUPLER.—A type of tuning coil very popular with amateurs, and one of the most efficient for general use. It employs the principle of mutual induction. Two coils are used, one capable of sliding inside the other, thus making the coupling, or the degree of proximity of one coil to the other, variable. Owing to the induction effect between the two coils good selectivity of tuning is attainable.

CAPACITY.—The property which a condenser has of receiving and holding a charge of electricity. Capacity is determined by the size of the plates, the distance between such plates and the nature of the substance filling the space between the plates (the dielectric). It is calculated by a formula based on these factors. Roughly, capacity is the electrical value of a condenser. The term is also used to indicate the total output from an accumulator or primary cell.

* * *

INDUCTANCE.—The property a conductor has tending to prevent the starting, stopping, or variation of the flow of an electric current in it. This property is greatly increased when the conductor or wire is in the form of a coil. The moment a current starts to flow a magnetic field is created round the wire, which induces a current in the opposite direction to that which has commenced to flow. This induced current momentarily obstructs the real current, which obstruction, however, is quickly broken down. This induced current is called "back" E.M.F. (Electro-motive Force). The same effect is caused by the stopping of the current, the induced current tending to maintain the flow.

How Wave Length is Controlled—(continued)

tance we include, the slower will become the frequency. The length of a wave is dependent upon the frequency with which the condenser charges and discharges itself across the air-gap. Therefore, if this frequency is reduced by the inclusion of inductance, the wave-length will be altered.

Suppose we add sufficient inductance in the circuit to halve the frequency which is responsible for the wave. A simple calculation will serve to show us that the length of the wave will be doubled. We shall only have five waves now, covering a distance of 186,000 miles, and one-fifth of 186,000 gives us 37,200. The length of each wave is therefore twice as long as before. The value of an inductance may be varied, either by means of studs, to which tappings are taken from the coil, or by the use of a "slider," which can be moved along the entire length of the inductance from end to end, so as to alter the amount introduced into the circuit.

It is now but a step to see how receiving stations are "tuned" to the exact wave-length of the sending station. The amount of capacity and inductance used by the transmitting station creates a wave of a certain length, and the operator of the receiving station adjusts the capacity and inductance of the receiving circuits until they are in resonance or "tune" with the "frequency" of the oscillations creating the wave. Until the receiving station is properly in tune with the transmitting station, no messages can be audibly received.

The Part Played by the Earth

By "X"

WHEN an antenna sets up electro-magnetic waves in the aether, these waves move outwards over the surface of the earth, and also penetrate the earth's surface to a certain depth, depending on the nature of the ground or water over which the waves are passing, and thereby setting up circulating currents in the part of the earth's surface penetrated.

The surface of the earth is not everywhere a good conductor of electricity, i.e., the sea and moist soil are better conductors than dry stone. In some places the surface materials of the earth are, in fact, good insulators.

The attenuation, or weakening, of the electric wave is on this account very different over different parts of the surface of the earth, depending on the fact that there is a greater or less penetration into the insulating portions, and a greater or less absorption of energy at the poorly conducting portions.

For example, a theoretical calculation (by Zenneck) shows that a station having a range of 1000 miles over a perfectly conductive expanse would have a range of:—

920 miles over sea water.
700 miles over fresh water or very wet soil.
560 miles over wet soil.
270 miles over damp soil.
150 miles over dry soil.
55 miles over very dry soil.

and these figures accord very well with practical experience.

Short waves suffer much more in passing over land (even flat land) than do long ones. This is due to the greater losses suffered by the higher frequency currents. The useful layer of earth becomes shallower and the consequent resistance greater. An ordinary high frequency current (say 300 metres with a frequency of roughly 2,000,000 cycles) would not be perceptible at a greater depth than 50 feet. Damped wave trains will penetrate even less than this distance.

It is quite possible to receive signals on an insulated wire buried in the ground.

As a general conclusion, the longest ranges are obtained over the sea, and the range falls off considerably if dry ground intervenes.

Great difficulty occurs in communication between two stations which have jungle or dense undergrowth intervening, especially if the jungle grows up to the station. A tremendous absorption of energy occurs; moreover there seems to be a layer of air, level with the tree-tops, at the same potential as the earth, and the wave travels along the surface of this and does not influence a receiving aerial, unless the latter be a good deal higher than the trees.

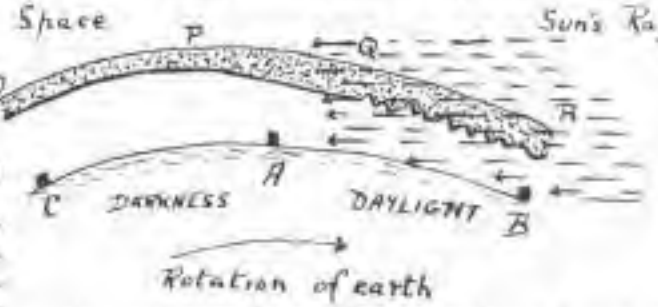
THE EFFECT OF SUNSET AND SUNRISE

Inter-communication between two stations is always worst when one station is in daylight and the other is in darkness. These conditions are illustrated in the sketch, where station "A" is in twilight, station "B" is in daylight, and station "C" in darkness. (It should be assumed that these three stations are at the corner of an equilateral triangle, i.e., that the distances between them are equal.)

Over station "A" at which sunrise is just taking place, the conducting shell is at least as sharply defined as during the night and is, therefore, capable of reflecting; while at "B" where the sun is high, the under surface of the shell is indefinite and no longer reflects well. Between "P" and "Q," the shell slants downwards towards the earth, forming what is termed the "shadow wall."

It therefore strengthens forward radiation or condenses the received waves at "A." Between "O" and "P", the shell is parallel to the earth's surface, as also between "Q" and "R."

Signals are best when both stations are either in daylight or darkness simultaneously. If the sun has risen on one station, but not on the other, signals are much weaker than at any other time. Also



the best wave length for transmission is not constant, but varies from time to time.

It would seem that the first marked phenomenon must be related to the varying thickness of the dielectric lower layer of the atmosphere, which is smaller when the sun is shining, and greater on the dark side of the earth.

Thus the waves generated at a station in daylight, where the height of the dielectric is small, in travelling westward, pass into a deeper dielectric layer, i.e., into a region where the conducting upper layer is further from the earth. In the opposite direction the waves travel from a deep dielectric into a shallower one.

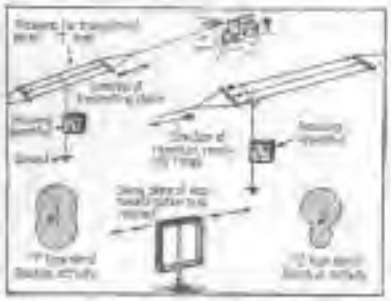
In the region of transmission from one to the other, the curvature of the upper conducting layer, i.e., of the upper surface of the dielectric, must be greater than when the conditions are uniform over the whole range. This may cause a greater loss of energy on the way.

An alternative explanation is that the zone where the change from light to darkness is taking place may be the scene of very violent and irregular ionisation or re-combination. This zone may disperse the waves in all directions. (Continued on Next Page)

Tips for Fans

AERIALS AND MAXIMUM EFFICIENCY.

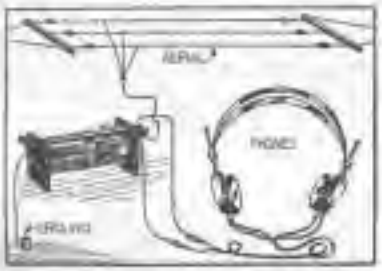
"T" INVERTED "L" AND LOOP AERIALS.



WHERE it is possible, the ends of a "T" aerial should point in the direction of the stations it is desired to receive. Maximum signals are heard in an inverted "L" when the lead-in is in the direction of the transmitting station. The plane of a loop aerial should be turned in the direction of the station being listened to.

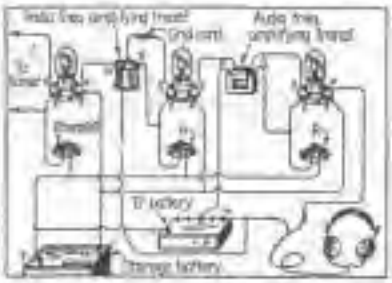
* * *

A UNIQUE CRYSTAL RECEIVER.



This is a two-slide tuner and crystal detector combined. The crystal is mounted in the slide contact and makes contact with the wire of the tuner, a piece of silicon being used. The circuit shown is a simple one, but the addition of a variable condenser will give finer tuning and selectivity for weeding out unwanted stations.

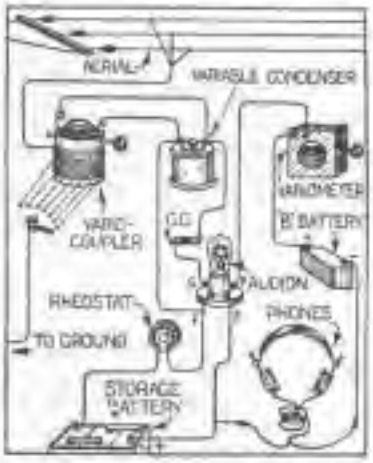
A RADIO AND AUDIO FREQUENCY RECEIVER.



Sometimes a pictorial representation of a circuit is more helpful to the experimenter than the usual diagram. This circuit gives the necessary connections for one step of radio-frequency, a detector and one stage of audio-frequency, using one "B" battery and one "A" battery. The "B" battery should have a voltage of at least sixty, with a tap at 22 volts for the detector.

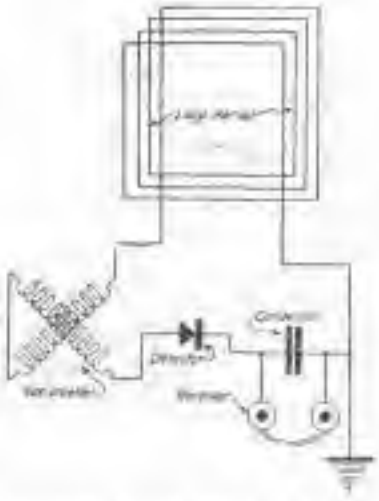
* * *

A SINGLE VALVE RECEIVER.



Now that vario-couplers are obtainable, partly basket-wound, and with a wave length capacity up to 9000 meters, the above circuit will prove useful. A single variometer is used to tune the plate circuit.

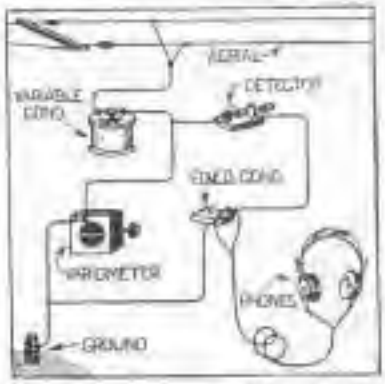
A LOOP AERIAL CIRCUIT FOR A CRYSTAL.



Although a loop aerial is not very efficient with a crystal detector, an experiment with one is interesting. This circuit shows a variometer in use as the tuning device.

* * *

A CRYSTAL DETECTOR CIRCUIT.



A simple crystal detector circuit employing a variometer and a variable condenser for tuning. A honeycomb coil may be used for loading for the longer wave lengths, and should be placed in series with the aerial.

The Part Played by the Earth—(continued)

In the same direction, it is not infrequently observed that strong signals can be sent or received when the twilight band is immediately behind a station. The band therefore appears to have some reflecting properties.

Operators in Arctic regions have also reported that strong signals are always received when auroras are observed. Auroras, in all probability, consist of zones of excessive ionisation, and their presence, coincidentally with strong signals, tend to confirm the theory.

Radio as a Home-Builder

An Educator and Entertainer
Music, Song and Story in every home

Grammy tells the family listened in

Teaching Willie

Listening to Mother

"It isn't square

Robert reads into his own

Daddy, the expert, contemptuously watches Billy's attempts to tune in.

Broadcasting Commenced

What we shall see throughout Australasia
Sydney leads in Daily Broadcasting Service

Party.

Mother listens in.

A Garden Party.

Ready for bed and story.

Father takes down the market reports. The loud speaker hangs on the wall.

Bed-time stories for the little ones.

The "C" Battery

ONE writer, on the subject of the "C" battery, asks if you were lucky enough to use a Packard twin-six, would it ever occur to you to disconnect one engine entirely, taking off the spark-plug leads and stopping up the gas manifold simply because the remaining cylinders would make the car go? This procedure is very nearly approximated when an amplifier is operated with the grid at filament potential.

Operating an amplifier in such a way that the grid voltage is too high (with respect to the filament) is not producing, but reducing, amplification with

Fig. 1

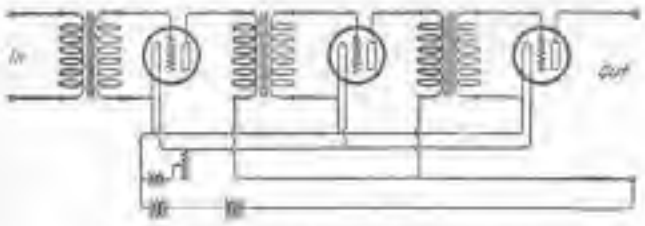


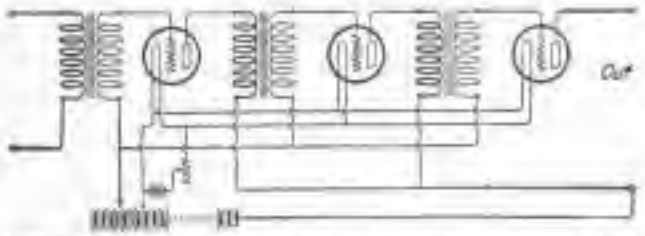
Diagram of Ordinary Amplifier Connections.

the bad effects of audio-wave distortion as well.

The "C" battery enables us to maintain the grid of the amplifier valves at the correct negative potential, and it is so easy to incorporate this most useful device in the construction of an amplifying receiver that it is a decided loss to work one on half-efficiency.

Figure 1 gives the usual diagram of amplifier connections. It will be noted that all the negative filament terminals are connected. It will be seen, also, that the corresponding terminals of the transformer secondaries are connected together and to the filament negative line. The other terminals of the secondaries are connected to their respective grids. Compare this now with the diagram shown in figure 2. The bottom terminals of the trans-

Fig. 2



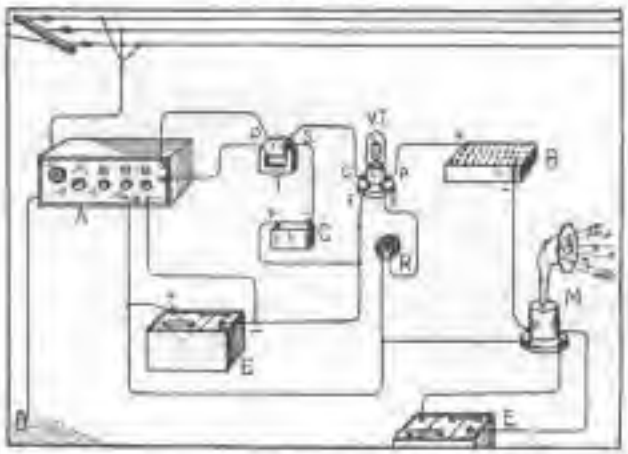
Amplifier Diagram with One Side of Transformers Joined to a Common Busbar, which is connected to the "C" Battery.

former secondaries are connected to a busbar of their own and then to the negative side of the "C" battery, the positive of which is joined to the negative side of the filament line. It is apparent that it is not necessary to have a separate "C" battery for each valve.

Again looking at diagram 2, (fig. 2) it will be seen that in addition to the positive side of the "C" battery being coupled to the negative of the "A" battery, the negative side of the "B" battery is also coupled to the "A" battery negative. From this it is clear that only one "B" battery need be used to perform all three functions of furnishing a bias to the amplifier grids, operating the detector valve and also the amplifier valves.

In designing amplifying receivers of the panel

Fig. 3.

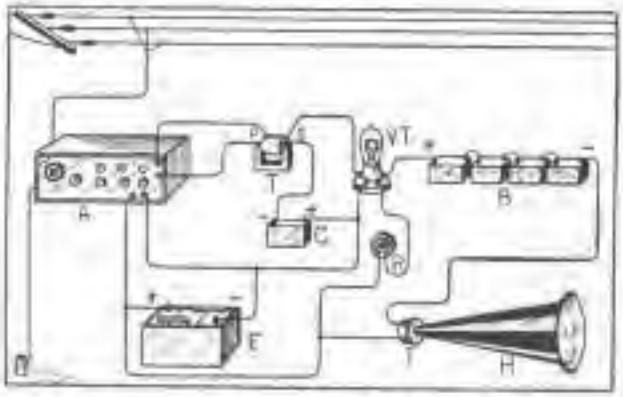


Adding an extra stage of Audio-Frequency to get the greatest volume out of the Loud Speaker.

types, one extra terminal on the panel will allow the "C" battery connection to be made to the transformer secondaries and it will well repay the extra trouble, to take care of the amplifier grids in this way.

In other words, when considering amplifiers, it is well to start from the grid as the zero potential member of the valve, rather than the filament negative, as is generally done. Then, by means of suitable voltage taps, the filament negative terminal can be placed anywhere in respect to the grid, then the

Fig. 4



Another way of getting the Loudest Sound.

detector plate terminal fixed with respect to the negative filament. For the plates of the amplifying valves you will now want all the "B" batteries you can get, within reason, since you have a way of hold-

ing the incoming signals on a portion of the curve where they belong, and as long as you increase your amplifier plate potential you both elongate and steepen the characteristic curve of the amplifying valves. Up to 120 volts can be used on the plates of the amplifier valves, but over 100 volts, there is very little gain. To use a separate "C" battery, three four-volt flash-light batteries may be used, with taps to give four, eight and twelve volts. The foregoing relates, of course, to audio-frequency amplification, but it is just as necessary in radio-frequency amplification as in audio, and the same scheme of connections can be used.

Figure 3 shows another stage of audio-frequency amplification added to a two-stage amplifying receiver. A radiotron U.V. 201 is the extra valve, with a separate "B" battery of 240 to 300 volts on the plate.

A separate "C" battery is coupled, negative to grid and positive to negative of "A" battery. A loud speaker of the Western Electric type is used in this circuit.

Figure 4 also shows the connection of an extra amplifying unit with the "C" battery of 10 to 20 volts included. A separate "B" battery is employed to minimise "howling." The loud speaker in this case is a Baldwin Type C amplifying receiver attached to an ordinary gramophone horn.

JAN MAYEN ISLAND.

An Arctic Wireless Station.

JAN MAYEN ISLAND, over which flutters the flag of Norway, is a dreary, desolate spot of land, rising forlornly from the icy waters of the North, far within the confines of the imaginary Arctic Circle.

It is an island where night reigns for nine long months of the year, and day for but a short twelve weeks. The nearest land is distant 500 miles.

It is a place of dreary desolation, intense cold, and high winds; and, in short, has nothing to recommend it to the average man in search of a solution to the housing problem. If we boarded a vessel at Land's End, Cornwall, and sailed or steamed away due north, we should eventually come to Jan Mayen Island.

It lies within the Arctic Circle, practically in the latitude of the North Pole, and the course followed by our vessel would have been along the meridian line, ten degrees west of Greenwich. This little spot, however, has attracted the attention and interest of meteorologists. The island is situated in the path of the Great North wind, one of the factors governing European weather conditions, and the idea of erecting a station on this outpost of habitable earth has been carried out by the Norwegian Government.

The station is able to supply valuable information regarding the weather, and enable regions farther south to forecast more accurately the kind of weather likely to be experienced as far as Europe is concerned.

The severity of the bleak north is tempered by the Gulf Stream, that huge warm water artery which flows to us across the Atlantic from the Gulf of Mexico. We are thus protected to some extent from the uninviting conditions which prevail farther north in parts of Iceland, and Jan Mayen Island.

The British Government also has evidenced an interest in lonely Jan Mayen Island and its new meteorological station, and has offered to contribute towards the fund required for the cost and upkeep of the station. It will undoubtedly prove of great value from the meteorological point of view, but the staff necessary to operate it will have to be simple, contented souls. Even then they will certainly not be sorry when the arrival of the relief ship is signalled across the waters of the lonely North.

A BABY CAN WIRELESS.

IF you have bought this magazine because you are interested in wireless telegraphy, but have not yet bought a set because you are afraid that your lack of knowledge will prevent you from working one, read on!

You need not even possess a mechanical turn of mind to enable you to operate your own set, adjust it yourself, and be able to "listen in" within a few hours of having bought it.

With almost every set sold nowadays there are given complete and simple directions how to fix and manipulate your instruments, and you will find these instructions no more difficult to understand than your first lesson on how to work a gramophone.

Also, do not be alarmed by any foolish report you may hear that your outside aerial will catch lightning flashes and the wire from that to your receiving set will carry the flash into the room and cause disaster there.

If you do not possess an earth switch—that is, a switch whereby you can "short" the aerial by connecting it to earth—do so. An alternative way is to connect the aerial lead-in wire to the earth terminal of your receiver when you have finished listening in.

The fear of electric shock when your set is "charged" with a message is another baseless rumor, born of lack of information.

THE DOCTOR AND HIS CAR.

WIRELESS telegraphy is a wonderful thing for getting people out of difficulties. Just listen to the story of a doctor and his car.

The doctor had driven to Boston with his wife to see her off on a steamer bound for New York. He performed the seeing-off so well that he saw himself off as well as his wife, for when he bade the last tender farewell he came on deck to find the gang-plank raised and the dock a hundred yards away.

He had no other choice but to continue the voyage, as the captain refused to turn back; but, not seeing why he should lose his car, he got the wireless operator to send a message to the Boston police. It was luckily picked up by an amateur, who promptly notified the police, who proceeded to carry out instructions in a satisfactory manner. The car was berthed in a garage, where the doctor recovered it some considerable time later.

A Three Valve Receiver

THE receiver herein described has been operated under all conditions, and has proved exceptionally efficient, and less subject to static interference than many others. It has been found, on test, to be much superior, both in electrical sensitiveness and mechanical adjustment, to anything previously tried.

With one lead of similar wire soldered to the water pipe as an earth, and employing a Magnavox Loud Speaker in place of the 'phones, loud signals are brought in from the distant stations, and radio concert is received in sufficient volume to fill a fairly large hall. On the plate of the last amplifying valve 135 volts were used,

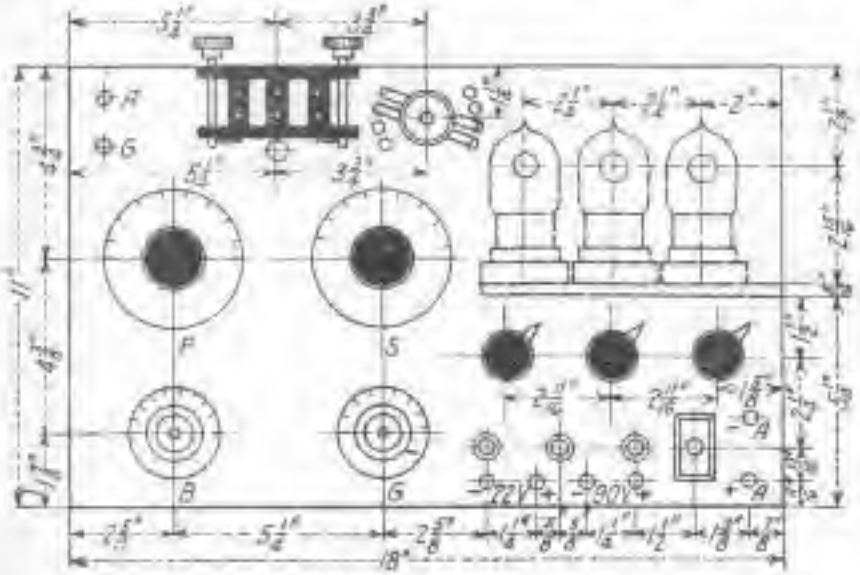


Fig. 1.—Plan of the Panel.

its ease and simplicity of operation, and its extreme sensitiveness to slight variations of coupling, together with the great gains in signal strength resulting therefrom, should be greatly appreciated.

Owing to its sharp tuning qualities, local interference can be easily minimised. In addition to its quality of causing the detector to oscillate on all wave lengths with minimum manipulation of knobs, it is compactly built, and small in size, considering the fact that every unit, including the two-stage amplifier, is contained in one cabinet and mounted on the same panel. The only external accessories being the "A" and "B" batteries, making the outfit easily portable.

The honeycomb coil inductances permit operation over the whole range of wave lengths.

Used with an "L" type aerial only 75 feet long, consisting of 2 7-22 stranded wires spaced 6 feet apart, but 90 volts give quite good volume. It is essential that the last amplifying valve filament be burned at full brilliancy to get the best results. The writer has used radiotrons both as detector and amplifiers, but any standard valve would probably give equally good results.

The apparatus required is as follows:—

1 Ebonite or Bakelite panel 14 in. by 11 in.
1 Geared Honeycomb Coil Mounting. (Panel type.)
1 Series-parallel Switch.
1 Primary Condenser, .0011 Mfd.
1 Secondary Condenser, .001 Mfd.
1 Grid Condenser, .0005 Mfd.
1 Bridging Condenser, .001.
3 Valve Sockets.
1 Grid Leak. (2 Megohm.)
3 Terminals.
1 U.V. 712 Audio-frequency Transformer.
1 Federal 220 W. Audio-frequency Transformer.
3 Rheostats.
3 Telephone Jacks (Optional.)
1 "A" Battery Switch.
1 U.V. 200 Radiotron Detector Valve.
2 U.V. 201 Radiotron Amplifying Valves.
2 Duo-lateral Coils of 25 turns each.
1 do 35 turns.
1 do 50 turns.
1 do 75 turns.
2 do 150 turns each.
1 do 300 turns.
1 do 550 turns.

With these coils stations up to 3000 metres may be heard. For the longer wave lengths other coils must be used.

The cabinet is of any suitable hardwood, and is 6 inch thick, 11¼ inches wide, and 28½ inches long, by 8 inches deep. A ¾-inch square wood slip is screwed on all four sides inside the cabinet at the right distance to bring the panel flush with the front

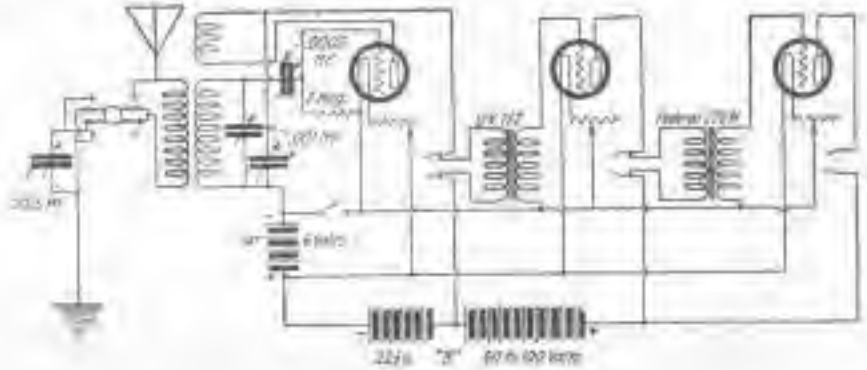


Fig. 2.—Wiring Diagram.

of the cabinet, and the panel screws are run into these slips.

In tuning up to 450 metres, use a primary of 25 turns, secondary 50 turns, and tickler 35 turns. The tickler is closely coupled to the secondary, and the tuning is done with the primary coil and secondary condenser. Longer wave lengths can be tuned in with the secondary con-

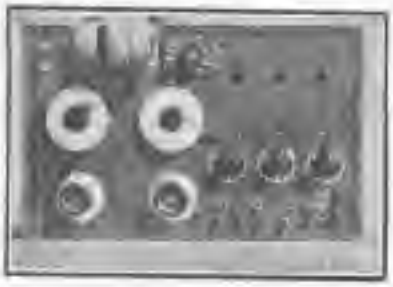


Fig. 3—Front of Panel.

denser, and for stations below 250 metres, tune with tickler coil and primary condenser. Secondary condenser should be all out.

Grid and bridging condensers are all in except when tuning for long distance, in which case, adjusting the grid and bridging condensers is necessary.

Figure 3 is a plan of the panel, giving the position and exact measurements for drilling to receive the various units. Figure 2 is the wiring diagram. Figure 3 is a front view of the completed receiver, and Figure 4 is the back view of the panel with the units assembled.

No provision is made in the cabinet for the "B" battery, as it is better to have, say, three 45 volt "B" battery blocks with the usual tapplugs; join them together in series, and then with short lengths of stranded, insulated wire, soldered to the clip connectors, to pick out the 22½ volts required for the detector, and to use whatever voltage is desired for the valves of the amplifier.

It is always better to make the back of a cabinet removable for the purposes of making any necessary adjustments from time to time. A very good way to put in the back of the cabinet is to insert two wooden or brass pins, with corresponding holes in the cabinet, and a spring keeper at the top, copying the manner in which the bottom panel of the front of a piano is kept in position. By following this plan the back can be taken right out of the way, a much better method than fitting it with hinges.

To lay off the panel, make a full-sized drawing from Figure 1, and paste it to the bakelite or ebonite which is to form the panel, let it dry thoroughly, and by drilling through the paper, all the holes will be in the exact positions to couple up the units.

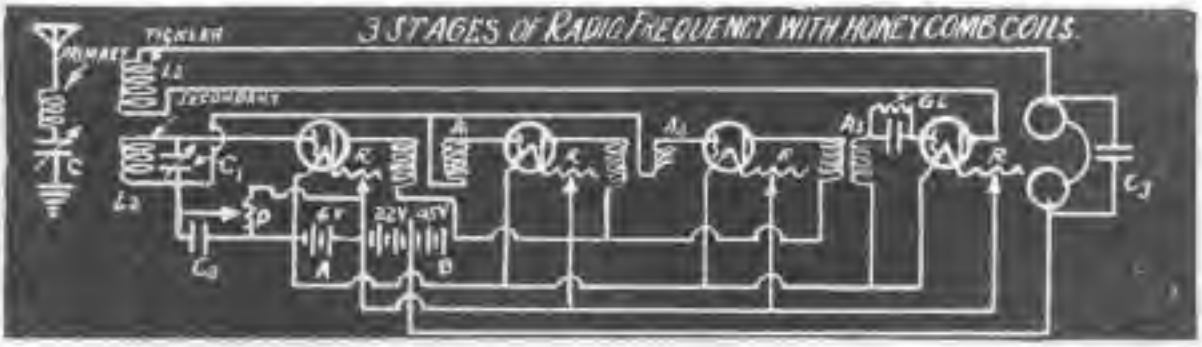
To the panel as described the writer added a potentiometer across the "A" battery, the negative lead to the "B" battery being coupled to the potentiometer slider. A little

Fig. 4—Position of the Various Units.

further refinement was obtained by attaching one side of the transformer secondaries to a 12 volt "C" battery, tapped for 1½ volt steps. The negative of this battery goes to the secondaries of the transformers, and the positive is joined to the negative line of the "A" battery.

Both the potentiometer and the "C" battery are of advantage if there is any tendency of the amplifiers to "howl."

Radio Frequency with Honeycomb Coils



A GOOD circuit for three stages of radio-frequency with honeycomb coil inductances is shown in the accompanying diagram.

L1, L2, L3 are honeycomb coils, 35 turns primary, 35 turns secondary, and 35 turns for tickler. C is a

For the Trans-Pacific Tests

.001 variable condenser; C1 a .0005 variable condenser; C2 a .002 fixed condenser; C3 a .00025 fixed condenser; P a 200-400 potentiometer; GC a .00025-.0005 grid condenser; G1 a 5-8 megohm grid leak; A1 a GV1714 (or other) radio-frequency transformer; A2 and A3 are the same; R a rheostat; the first three valves are amplifiers and the last one a detector valve.

The Electronic Reaction of Abrams

UNDER the above caption, Pearson's Magazine (New York) has printed a series of articles on what is described as the most revolutionary discovery of the age—the Abrams method of diagnosis and treatment.

Dr. Albert Abrams has established a clinic at San Francisco for the purpose of carrying out his investigations into the "electronic reactions" methods of detecting and determining disease.

It is stated that hundreds of physicians from all over the United States, are sending in specimens of the blood of patients in order that the Abrams method of diagnosis may be applied to them.

Each blood specimen is placed in turn in an electrical device invented by Dr. Abrams, and the "vibratory rate" is read off by varying a rheostat—the readings indicating whether disease is present in the patient, the nature of the disease, its locality, and its history.

When the disease has been determined, a course of treatment is prescribed with another invention of the doctor's—called "The Oscilloclast," an instrument described as being capable of breaking up ordinary alternating current into various vibrations. Dr. Abrams measures these vibrations with the same instrument that measures the radio-activity of the disease, and when he gets the same vibratory rate as that of the reaction of, say, a cancer specimen, he applies this vibratory rate to the cancer specimen and has discovered that the effect is to destroy the cancer reaction.

Upton Sinclair, the great American novelist, had his attention directed to Dr. Abrams' discoveries, and, by arrangement, attended the clinic at San Francisco to learn at first hand just what was being done in the diagnosis and treatment of disease by the new method, and has written a lengthy pamphlet describing what he witnessed, or what he has termed "The House of Wonder" at San Francisco.

Amongst other things he quotes a letter he saw from a Dr. Wm. G. Doern, of Milwaukee, U.S.A., a physician studying the Abrams' methods. This physician describes a case of cancer of the pylorus, the opening from the stomach into the small intestine.

This was a far advanced case, and the patient was treated by the "oscilloclast," and the malignancy of the disease was destroyed, but the digestive disturbances continued, because of the mass blocking the stomach, and so an operation was performed.

It was found that this cancer had degenerated, and around the edges the body had begun turning it into connective tissue, or what in everyday language is known as gristle. In the case of sarcoma of the leg bone, the size of two fists, it was found that the mass could be scooped out by the handful, and all around the edges the body was turning it into fibrous tissue. As you may know, cancer and malignant tumors are the mysterious turning of human tissue into a lower form of unorganised cell life; those lower forms of cells begin to eat up the body. But here, suddenly, the process was reversed: the mysterious power of the evil cells was gone, and the body was eating up the cancer!

What happened in these cases of cancer happens with every form of germ infection. Ascertain the vibratory rate of the disease, ascertain what current will cancel that reaction, and then pour into the body a current at that rate, and you destroy the activity of the germs. You cannot, of course, always restore tissue; if a lung has been eaten up by tuberculosis, you cannot build a new lung. But, arrest the course of the disease, and take good care of yourself, and often you will be astonished to see how far the healing forces of nature can rebuild what has been ruined.

Dr. Abrams makes a guess as to why the same vibratory rate destroys the disease activity. He tells how he once saw Caruso at a dinner party tap upon a wine glass and determine the musical note at which it vibrated, and then sing the musical note at the glass and shatter it to fragments. In this case the vibration is reinforced by new energy, its violence is continually increased, just as a swing is made to go farther and farther by each additional shove. Dr. Abrams believes that this is what happens to the disease germs, or rather, the millions upon millions of whirling electrons which compose the molecules of these germs.

The vibrations are intensified by the applied vibrations, the electrons are flung apart, and that which was a disease germ becomes something else. This guess sounds fantastic, but it happens to be closely in line with what we know of radio-activity.

One of the first developments was the breaking down of the atom.

The so-called "elements" were discovered not to be permanent; they could be changed into one another. Radium was a product of the degeneration of uranium, and was degenerating into a form of lead. Scientists of eminence, such as Sir Walter Ramsay, announced that the transmutation of metals had become a fact. We are therefore asked not to be over-sceptical when Dr. Abrams suggests that by means of a current he can change the atoms of cancer into the atoms of some other substance.

Asked if the applied vibrations might not injure living tissue, he answers that there is nothing in the normal body which yields the same vibratory rate as disease. He knows this because he has tried tens of thousands of experiments.

Dr. Abrams has ascertained that pain has a certain vibratory rate, and if you have a pain he can locate it; also he found the vibratory rate which cancels pain, and has taken the "oscilloclast" to a dentist's rooms and demonstrated to several dentists, that work, otherwise agonising, could be done practically without sensation. He has even made it possible to perform a surgical operation on the rectum, an extremely painful matter, without anaesthetics.

There has been founded in San Francisco, by some

of Dr. Abrams' pupils, an International Association for Racial Purification.

The doctor, who happens by rare good fortune to be a man of independent means, has pledged the sum of fifty thousand dollars to its purpose, which is to advocate that every child upon entering school shall be examined by the electronic blood test, before the ravages of disease have made headway in the body. The treatments which remove disease will only take three or four hours and the child does not know what is happening.

Sir James Barr, Past President of the British Medical Association, has been using the Abrams' method in his practice for the past two years, and it is endorsed by Dr. Frederick Finch Strong, lecturer on electro-therapeutics at Taft's Medical School, Boston, U.S.A.

When medical men of the calibre of those mentioned above endorse this very extraordinary "discovery," the layman is prompted to withhold his judgment until further information is available.

Elementary Magnetism and Electricity

IF the beginner in wireless understands some of the simple elementary principles of magnetism and electricity, he will find it of considerable assistance when he comes to try to grasp the more complicated problems of the science.

The name "**Magnet**" originated from the name of a town in Asia Minor, called Magnesia, where the loadstones, which could attract small particles of iron, were first found. The first discovery is recorded as having been made by the philosopher Plato, who was born 480 years before the dawn of the Christian era.

Magnetism is found in nature in the form of ore, commonly known as loadstone, or magnetite by the mineralogists. It is found in many parts of the world.

Magnets, as we know them, have either the familiar horse shoe shape or a form known as a bar magnet. To make a bar magnet, a piece of steel is treated with loadstone (also spelled lodestone) and if it is then suspended by a thread from the middle it will point north and south, acting as a compass. The end pointing to the north is the south pole of the bar magnet, while the end pointing to the south is the north pole of the magnet. If a needle or other steel object is brought near to the bar magnet, it will be attracted at either end, but in the centre of the bar there will be found to be comparatively no magnetism. An interesting experiment may be performed with either a horse shoe or a bar magnet, some iron or steel filings and a piece of white paper.

If the paper is placed on top of the magnet, and the iron filings scattered on the paper, the filings will arrange themselves in wave-like formation, the lines extending from the magnetic poles, and in faint lines circling to the opposite poles. These lines represent the magnetic lines of force, which extend from one pole to the other in all magnets, the strength being less as the distance from the poles increases. These lines of force, in passing from one pole to the other are known as the magnetic circuit.

In the laboratory, a piece of paper is stretched over a bunsen burner and some melted paraffin wax is poured over the paper; on this melted wax some filings are scattered and a magnet is placed underneath. When the wax is cold, there is a permanent record of the magnetic lines of force shown by the filings which will have arranged themselves along those lines by the influence of the magnet.

The horse shoe magnet is simply a bar magnet which has been bent into horse shoe shape, and a piece of steel is usually kept across the ends of a horse shoe magnet to form a closed magnetic circuit and thus help to retain the magnetism.

If a magnet is placed in acid so that the outside is attacked and dissolved, it will be found that the magnetism is greatly lessened, if not entirely destroyed. This proves that the magnetism is largely confined to the surface. In some electrical machines a large number of thin magnets are used in preference to one large one, and the advantage from doing so will be seen from the foregoing.

The thin magnets are called "laminated" or leaf-form magnets.

If a magnet is placed near to a piece of iron or steel, the iron or steel also becomes a magnet, but loses its magnetism as soon as the permanent magnet is taken away. The magnet is said to "induce" magnetism in the iron or steel and the process is called "induction."

A bar magnet may be made by laying a small bar of steel on a flat surface, and then stroking it from the centre with a bar magnet held in each hand. Only hard steel is used for making permanent magnets, soft steel or iron being unsuitable for the purpose. Soft steel or iron is used for making another kind of magnet, called an "electro-magnet."

If some bell wire is coiled round a piece of soft iron, and the ends of the wire attached to a dry battery or any kind of battery, with a switch interposed, when the switch is closed the electro-magnet will pick up pieces of steel or iron, and when the switch is opened the magnet will drop the steel or iron.

Electric cranes are made on this principle, capable of lifting many tons. They are used in ironworks to lift unwieldy iron or steel goods, which would otherwise entail considerable labour in passing chains round the object to be lifted. The usual crane hook is attached to a large electro-magnet,

the crane is lowered until the magnet touches the object to be lifted, the switchman applies the electric current, at the same time operating the lifting mechanism of the crane and when the new position is reached the current is switched off and the magnet releases its load.

If two bar magnets are suspended from their centres, and the two north or south poles are placed near each other, they will be found to repel each other. If a south pole is placed near a north pole, they will attract each other and stick together. This proves that like poles repel, and unlike poles attract. Electro-magnets behave in exactly the same way.

If a small pith ball, suspended by a thread, is approached by a glass rod rubbed on woollen material, the pith ball is attracted, showing that electricity has been generated in the glass. If a bar of sealing wax is now rubbed in like manner and brought near to the pith ball, the ball is repelled, demonstrating that electricity, but of another kind, has been set up in the sealing wax. In electricity, like poles repel and unlike poles attract, just as in the case of magnetism.

Early experimenters suspected that some relation existed between magnetism and electricity, but it was not until 1819 that Oersted of Copenhagen, Denmark, proved this point. He demonstrated that a wire carrying an electric current would deflect a compass needle. The needle tends to turn at right angles to the direction of the current in the wire, the degree of the angle being in proportion to the strength of the current. If the current flows right to left, the north pole of the compass needle (which is, of course, a bar magnet) turns in the opposite direction.

Around a wire carrying an electric current a magnetic field is formed, that is to say that from the wire outwards in all directions there is an invisible something, akin to the mysterious "something" which enables a magnet to draw to itself pieces of iron or steel. This "something" flows round the wire, in one direction if the current flows in a certain direction, in another direction, if the direction of the current is reversed.

For the Experimenter

IF you are going to experiment with your wireless set, and add to it, and realise the joy of making your own instruments, you will need a working knowledge of the art of soldering.

Again, if your aerial wire snaps in the night, it is a bad policy to make a rough join. The two strands should be soldered together. Bad "joins" are fatal to good results on your receiver.

The most important thing in soldering is to have the ends you wish to connect, clean.

The presence of dirt will retard the fusion of the two metals, and so, before heating either of them, ascertain that they are both scrupulously clean.

You will require the following articles for your soldering outfit.

A soldering-iron, tin of Fluxite, a file, a stick of solder, some sandpaper, a pair of small, clean pliers.

With these materials in hand you are ready to start. First, heat the iron. This can be best done in a plumber's blow-lamp, or on a gas ring.

There is a certain temperature to which to heat the iron, and it is most important that this exact temperature is reached.

This is the most difficult thing the beginner will be called upon to judge. Experts can tell by the amount of green flame round the hot iron; others withdraw the iron and judge by the "feel" of it when the palm of the hand is placed a few inches away.

Probably the most reliable method is the following:

Withdraw the iron from the flame and dip it for a second in the Fluxite. Note whether the paste burns off at once or merely melts and runs about the surface of the hot iron. If the iron is ready for use, the paste will begin to fizzle at once, and the iron should not then be made any hotter.

The next thing is to "tin" the iron. Take a file and file up one of the faces of the iron from the point for about half an inch until it is clean and bright.

Do this as quickly as possible, so that the hot surface does not have time to be affected by the air. Next dip the prepared part in the Fluxite and rub it with a stick of solder which has also been dipped in the Fluxite. You may find that a piece of sal ammoniac to rub your iron on will help the "tinning" to take better.

You will then have a coating of bright, melted solder, into which you can melt more and apply it to the work in hand as it is required.

Replace the iron in the flame.

Now take the two wires to be joined and smear with Fluxite; then remove the iron from the flame and make sure that the tinning is still clean and bright.

Prepare enough solder to enable you to dip at 3 both pieces of the wire. Twist them about until they are well tinned. Dip the tinned ends in Fluxite, and with the clean pliers screw them tightly together. Finally, dip them in the melted solder again for a few minutes and the job is done.

Don't buy too small an iron, as one with a copper "bit" three inches long by one inch square will retain the heat longer and enable you to do practical work, whereas a tiny bit will go cold very rapidly and you will wonder why you cannot solder properly.

A Cigar Box Amplifier

By "Experimenter"

THERE are experimenters and experimenters. One type will not make a move until everything is just exactly right—bakelite properly drilled—everything fitted up in the best possible way.

It is quite all right to be an experimenter of that type, but he often finds that he has just put in a lot of good work which has to be undone in order to make some slight but necessary improvement.

The experimenter who achieves things is the one who makes anything do to try an experiment with, and then builds up permanently when the best result has been attained.

Fig. 1.—Front of the Cigar Box Amplifier.

I wanted to try an amplifier and loud speaker horn. Would one stage do, or two, or three,—which? I had not the slightest idea of what was necessary to fill my room with radio concert music, and thought out the plan of using a cigar box as the medium on which I would couple the various parts together to try one stage of audio-frequency. I procured the transformer, rheostat, a UV-201 radiotron and valve holder and proceeded to mount them. I procured a "Monopole" cigar box, cut off the bottom as the wood was very thin, nailed up the lid, and with my gimlet to bore the necessary holes. I had the audio-frequency unit mounted in the time I would have been thinking out how to bore a bakelite panel. I added a second unit in the same way, and desiring to know what was the maximum result I could get without distortion I tried the third stage.

I stood the box on edge and mounted the valve holdees on the upper edge or side. In the centre of each end and of the top (now become a "side") I fitted a rheostat with the knob outside.

Four terminals in each end gave me the necessary connections for the "A" battery and input from the detector valve, and output to loud speaker, "B" battery positive connection and the negative line connection of "A" battery for the bottom terminal of the secondaries of the transformers. Two of the transformers have vertical cores and one a horizontal one. The latter is in the middle, and this, together with the fact that the lead wires to all connections are necessarily short, perhaps accounts for the efficiency with which the amplifier operates. The circuit is the usual one—leads from the detector to the primary terminals of the first transformer, secondary terminals to grid and negative line. The plate of the first amplifying valve is coupled to one terminal of the primary side of the second transformer, and the other terminal to the "B" battery. The secondary terminals are coupled, one to the grid of the next valve, the other to the negative line of "A" battery, as before, and so on with the third transformer.

On the left side of the box, the two bottom terminals are for the positive and negative "A" battery to light the filaments. The upper pair of terminals on that side are for the input from the detector valve. On the right side the upper pair are for the loud speaker, and to these inside the box, are coupled the plate of the last amplifying valve and a connection from the "B" battery positive. This latter is connected inside to the terminal directly beneath it, the outside of which is joined to the maximum voltage "B" battery. The remaining lower terminal on the right side is attached to the negative line of the "A" battery and inside the box, a wire runs from this terminal to the bottom terminals of all the secondaries of the transformers.

Fig. 2.—Back view of the Amplifier, showing the "Works."

How to Begin: By an Amateur for Amateurs

Article 2

I HAVE never forgotten the tuning fork experiment described in my first article, because it conveyed to me very clearly the fact that sound vibrations created at one point, travel through the air, and when they are intercepted by another piece of apparatus in tune with the piece creating the vibrations, similar vibrations are set up in the second piece of apparatus, which our ears convert into sound. So it is with vibrations of the ether. A transmitting apparatus, capable of being "tuned" to give out certain rates of vibrations, agitates the ether—the agitated ether travels in all directions in the form of waves—if a receiving apparatus intercepts the agitated ether, and is tuned to receive the vibrations at the same rate as they are sent out, we get the vibrations in the telephone receivers and, again, our ears convert these etheric vibrations into sound.

The tuning elements in a transmitting or a receiving set are "inductances" and "capacities." Inductances are coils of wire of various forms; capacities are what are called "condensers" and consist of plates of metal, one set of plates being separated from the other set by air, waxed paper, mica, ebonite, or glass.

When we manipulate inductances and capacities in a wireless set we do exactly what the piano tuner does when he tightens or slackens a piano wire—who causes the string to vibrate faster or slower, according to the "sound" he requires the string to give out.

Enquiring into the matter of inductances, I found that there were single and double slide tuners, loose couplers, vario-couplers and variometers, tapped inductances, honeycomb coils, duo-lateral coils, basket coils, etc. etc., and got lost in the maze. I learned that one chose that type of inductance which would most efficiently cover the range of wave lengths it was proposed to try the receiving apparatus on. I was informed that wave lengths range from 150 meters (the meter is the French yard) to 25,000 meters. At that time there was one amateur transmitting at 250 meters, one club at 950 meters, a firm was conducting tests on 1200 meters, and Mr. Maclurcan's Sunday night radio concerts were sent out on 1400 meters.

The range immediately required was, therefore, 250 to 1400 meters. I found that the vario-coupler, variometer type of inductance was designed for wave lengths up to about 450 meters, so vario-couplers and variometers were out of the question.

The tapped inductance, single slide or double slide tuner, and the loose coupler would all cover the range of wave lengths, but as only a few turns of the coiled wire would be in use on the lower wave lengths, the remainder of the wire acted as a "dead end" in which a good portion of the signal strength would expend itself, and so make for inefficiency.

This information prompted me to continue my search for the ideal inductance, and I turned my attention to honeycomb coils. These, I ascertained, would cover all the range of wave lengths from 150 or 200 to 25,000 meters, by using different combinations of coils for the various ranges. I found, however, that there were some differences of opinion amongst experimenters and practical wireless operators, as to the efficiency of honeycomb coils, on wave lengths of 150 to 500 meters. Their efficiency past that point was unquestioned, but many were of the opinion that the vario-coupler, variometer, inductance was better for the lower wave lengths. Later on, I saw that as many experimenters and practical wireless operators favored the honeycomb coils for all wave lengths as were against them for the lower wave lengths, so decided to use the honeycomb coil inductance. I now required some kind of a coil holder and the necessary coils. Seeing an illustration of a honeycomb coil holder of the "stand" type in a catalogue, I got one built like it at a local radio apparatus house, and a very good job they made of it, too. The same radio dealer advised me as to the coils I would require to cover 200 to 1400 meters wave length.

I obtained two of 25 turns each, two of 35 turns, one fifty, one one hundred, and one one hundred and fifty turns coils.

That settled the inductance question.

I now had to have some kind of a "detector," and had my choice of either a crystal or a valve.

A detector is necessary in a wireless receiver because the electrical current used in transmitting is what is called "alternating" current. That is, it is a current which starts from a zero point, gradually rises to a maximum pressure of positive polarity, then it falls to the zero line again, continues below it to a maximum negative polarity and back to zero once more.

This "alternation" goes on very rapidly, so rapidly that a telephone receiver cannot record vibrations of audible frequency, when actuated by such a current, so a detector is employed to cut out one-half the wave, leaving the other half to operate the telephone receivers by a series of uni-directional impulses.

Everybody starts with a crystal detector, so I followed the good example, procured my crystal detector and several kinds of crystals, and proceeded to assemble my receiving outfit. Learning that I would get a better result if I included a small (.001) fixed condenser in my receiver, I procured that also. Just about that time a friend called in, who is a very keen experimenter. "Why did you get honeycomb coils for a crystal detector?" he asked. "Why not?" I ejaculated. "Well," he said, "there is no reason why you should not use them for a crystal detector, and you have saved yourself some expense, as you are bound to go in for valves before very

long, and your honeycomb coils will be just the thing for a valve receiver."

Now a honeycomb coil holder has provision for mounting three coils, the first one on the left is for the primary and is movable; the second or middle one is fixed and is for the secondary, whilst the third one is also movable and is called the "tickler" coil.

I screwed the little crystal detector down to the base board of the coil stand, mounted a pair of terminals, just the distance apart to allow the eyelet holes of the fixed condenser to slide on to them, connected up with some No. 24 s.c.c. copper wire, one lead from the secondary coil to the "catwhisker" side of the crystal detector, the "cup" side of the detector being carried on to one of the terminals. The other lead from the secondary coil was taken to the other terminal, and both terminals were "bridged" by the .001 fixed condenser as already pointed out. On my coil stand were two small terminals for each coil, so the connections were easily made. One terminal of the primary coil was for the aerial, and the other one for the earth connection. I found that I would not need the "tickler" coil in a crystal set.

To complete the set I now had to decide about head 'phones.

These could be procured from 120 to 8000 ohms resistance.

Enquiries brought me the information that 1000 ohms resistance in each 'phone, 2000 in all, would do, and would be a suitable set for a valve receiver.

My next step was to consider the aerial and earth connection problems, but I will deal with those in my next article.

(To be continued.)

What Radio is doing for an Invalid

MR. A. J. De LONG, of Lafayette, Indiana, U.S.A., has been a bed-ridden invalid for many years. The advent of radio broadcasting brought a gleam of sunshine into his life, which was otherwise very drab and drear. From the leading broadcasting stations he is able to bring the best of vocal and instrumental talent to his bedside, and he can flood his room with song and music by means of his receiver and loud speaker. His receiver has a detector valve and two stages of audio-frequency, and it has created for him a wide circle of friends, folks he has invited along to hear his radiophone concerts. He says that the new friends he has enlisted by means of the radio have meant more business for him. Although he cannot leave his bed, he started a magazine subscription business in Lafayette, and in four years he has built up a good connection. He handled over twelve thousand letters last year.

Our illustration shows him lying in bed with his typewriter before him, and this is how he attends personally to all his correspondence.

He is pleased to know that American hospitals are installing receiving apparatus to while away the hours for the sick and suffering. He believes that in the future a wireless telephone apparatus will be as common in places where there is sickness as is the electric fan to-day. He finds that in listening to the radio entertainments he is less susceptible to fatigue, more alive to everything, and much more contented with his sad lot, and is of the opinion that radio has done for him what medical science has failed to accomplish.

Some day we shall help the sick in Australasian hospitals by brightening their lives with radio concerts.

How Mr. De Long attends to his correspondence.

Here is a field for the charitably-disposed, which can be productive of more good for the sick than many other things on which their energies are dissipated.

Exit the Overhead Aerial

PRIOR to the war, the name of Dr. J. Harris Rogers, of Hyattsville, Md., U.S.A., although a scientist of reputation, was practically unknown in the wireless world.

In 1908, Dr. Rogers conceived the idea that it was the earth and not the ether that furnished the real medium for the transmission of wireless waves. It was not until after the war, however, that the practical nature of his research work was made known. During the war time hundreds of thousands of words contained in important despatches were received on Dr. Rogers' aerial system, which it would have been

Dr. J. Harris Rogers, Inventor of the Underground-Underwater Aerial

impossible to receive on the huge tower aerials of the American Naval Wireless system, on account of storms rendering operation dangerous to life and to static conditions, the latter rendering signals undecipherable. With two or three fifty-feet, insulated wires thrown into Lake Michigan Dr. Rogers daily listened in to German official reports, and to Nauen, the Eiffel Tower, and many long-wave American stations. Early in the war there was a little ceremony at Dr. Rogers' home at Hyattsville, when American naval officers, travelling in mufti, heard, to their intense astonishment, German confidential plans and directions as clearly as if they were somewhere near the front line trenches, and without static or other disturbances.

In the experiment, Dr. Rogers used a large tuning coil, a variable condenser, a one-step amplifier and a pair of telephone receivers. Not a very elaborate outfit for such wonderful results.

On a recent occasion, when a heavy electrical storm was in progress, Dr. Rogers, using a loop aerial suspended in a brick-walled well heard far distant stations with absolute distinctness and with no interference to speak of. He illustrates the difference between an outdoor aerial and his underground loop in a startling manner. With a switch he first throws in the outdoor aerial and then throws in the underground one. The effect convinces the most sceptical.

With three stages of radio-frequency, a detector and two stages of audio-frequency amplification, and the underground loop he has brought in vocal and instrumental music over 220 miles on a 360 metre wave length. There was strong static in the air at the time and trams, passenger, and goods trains, were all clashing and banging 200 feet away but none of these disturbances interfered with the reception of the concerts. This was a remarkable performance as the underground aerial had, up to that time, proved capable of anything with long waves, but short wave communication had not been satisfactory.

With a 4000-foot wire buried only three feet deep, in a drain pipe, and running in a westerly direction, he plainly heard communications between German units on the European front and he amazed army and naval officers by his success in this experiment. Several prominent wireless experts said that it was impossible to propagate wireless waves through water. When Dr. Rogers said it was possible he was looked upon as a dreamer.

He was determined to prove his assertion, and at the age of 67 he bent every energy to his task. He first made tests in a small pond near his home and transmitted messages to his house, two miles away, with underwater wires. Then conceiving that salt water might act differently, he established himself near the sea-shore, and, in co-operation with naval experts, established perfect communication with submarines lying submerged.

With the Rogers aerial system a submerged submarine heard Nauen, Germany, and distant stations on a 12,000 metre wave length.

A transmitting station operating with 48 amperes aerial current, 600 feet away from a receiving station, using the Rogers' underground aerial did not interfere with Nauen being picked up on 12,000 metres and New Orleans on 5000 metres. In the ordinary way, and with the ordinary overhead aerial system a transmitting station has to be some miles from a receiving station on account of the interference. In the case quoted, there was no inter-

ference and no static. Aerials far under water were used to receive Cavite, Philippine Islands, 8,100 miles distant.

Dr. Rogers uses insulated stranded cable for his underground or underwater aerial, and at his experimental station at his home the wires radiate in the form of umbrella ribs, but he has found that he gets best results when the wire used as the aerial is at right angles to that used as an earth, or when the two wires are opposite to each other.

The basis of the Rogers' theory completely upsets the accepted theories. Ever since the days of Hertz, scientists have believed that electro-magnetic impulses pass through space above the earth's surface. Dr. Rogers has formulated another hypothesis. He says that the energy liberated at the base of the aerial is propagated through the earth as well as through the ether above and that an elevated aerial at a great distance would be actuated by the earth waves just as effectually as if the waves reached the aerial through the ether. When these earth waves reached the base of the aerial the potential of the plate (the earth) would be raised and lowered and the aerial energized accordingly. He asserts that both earth and air waves are propagated at the same time, one above and one below the surface of the earth.

He believes that ether waves travel through the air, but holds that because of the earth's curve, they die out in strength as they proceed, and that, at great distances, many of the waves transmitted through the ether never reach their destination at all, the result being really achieved through the earth medium.

The post-war revelations have discovered Dr. Rogers to be quite an amateur Edison. Prior to 1908 he had secured no fewer than fifty electrical patents, and it is possible that his collection of electrical apparatus, mainly wireless apparatus, is second to none in the world.

Amateurs who wish to experiment with the underground aerial have only to construct a loop of good insulated wire and bury it, then bring the leads to the aerial and earth terminals of their set to have a demonstration of what can be accomplished with Dr. Rogers' aerial system. The signals will not be quite so loud, but they will be clear and free from static interference, not to mention other kinds of interference.

Dr. Rogers in his Laboratory, one of the Best Equipped in the World

Our Own Broadcasting Programme

This programme can be heard by anyone who succeeds in remaining awake. Merely connect up your sewing machine, using a borrowed umbrella as an antenna. The service is free, positively. Tune your instruments as much as you care to.

DAYLIGHT THRIFT TIME.

SUNDAY.

7 p.m.—Big Bill Haywood will deliver a sermon on "Feet, Why Your Left should Synchronise with Your Right when the Police are After You."

8 p.m.—Dr. Thomas J. Nicholsenpher, of the firm of Jump Brothers, will deliver a lecture on "What Comes after the Purchase Price," describing in verse and prose the appearance and whereabouts of hill collectors and sheriffs.

Coming Soon!

8 p.m.—Remarkable demonstration of reproduction of a spirit photograph by radio. Subject: "Ex-soldier Receiving the Bonus."

10 p.m.—The brothers Trade and Mark Smith will demonstrate new styles in coughing.

MONDAY.

7 p.m.—Bedtime story by Humpty Dumpty, "Never Sit on a Wall"; or, "Don't be an Egg."

8 p.m.—Professor Hoof will teach the latest dance, the "Salary Slide," originated on Saturday and now a weekly lotterite.

9 p.m.—Lesson in concentration. Over a period of sixty minutes Hiram Gooseberry, the famous mathematician, will count the revolutions of an electric fan.

10 p.m.—Swimming lesson on the wireless waves, by Annette Kellerman.

TUESDAY.

7 p.m.—This entire evening will be devoted to an illuminating lecture by Mr. Hi Frequency, on radio elementals, including valuable technical data on "How to Insulate the Ground." Miss Lotta Gas demonstrates the ease with which persons are put to sleep by ether waves.

Squire Owens will lecture on how to yank grand opera out of an electric light socket.

(For Wednesday, Thursday, Friday and Saturday roll your own.)

A long wave gets a short welcome from a broadcasting fan.

More About Spider-Web Coils

DETAILS were given in last month's Review for the construction of a tuner employing spider web coils, which could be used with either a crystal detector or a valve. This type of coil can be adapted to the three-coil circuit in the very simple manner shown in Figure 1, where primary, tickler and secondary are mounted on thin wood or one-eighth Bakelite, and attached to a wooden stand. Terminals are provided for each coil, so that the necessary connections may be made. Small clips of thin brass will permit the coils to be changed round for the purposes of experiments.

The coils may be wound on 1-16 or even 1-32 Bakelite. The primary has 60 turns, the secondary 100 turns, and the tickler 120 turns of No. 24 s.c.c. copper wire, on a Bakelite disc as described in the February article. Loading coils for longer wave-lengths may be made up in the same way, wound, say, to 150 turns each, and with a variable condenser in series with the primary coil and aerial.

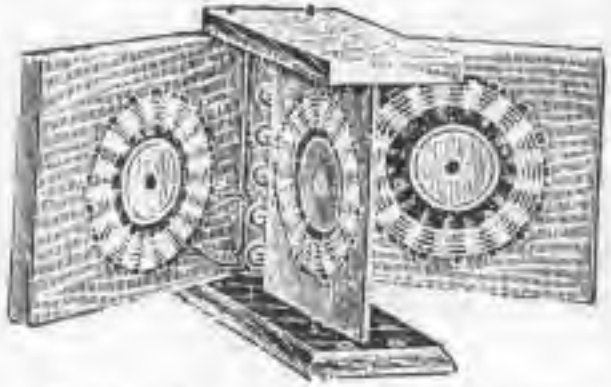


Fig. 1.—A Three Coil Stand for Spider Web Coils.

Fig. 2.—A "close-up" of a Spider Web Coil in the Course of Construction.

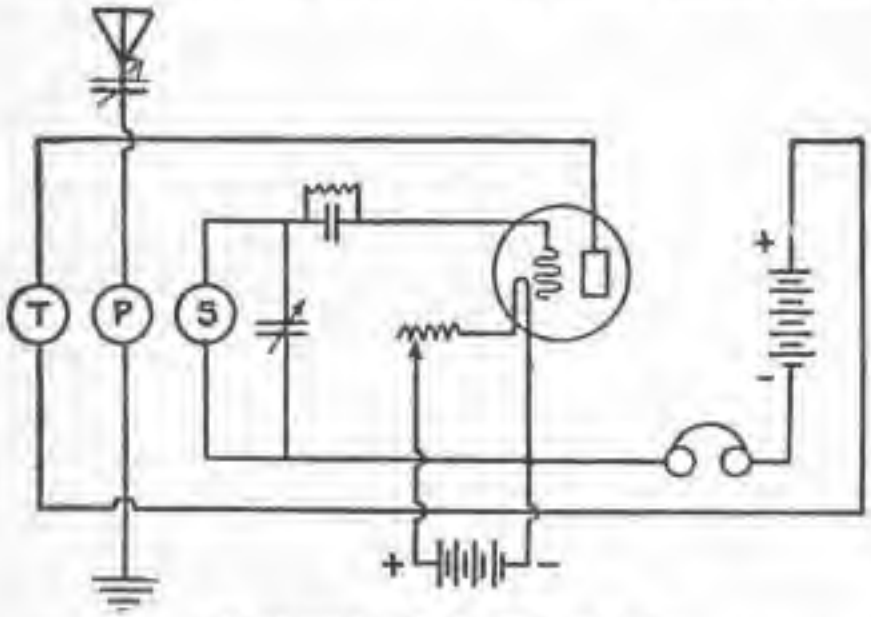


Fig. 3.—Diagram for the Three Coil Circuit.

Figure 2, a "close-up" of the winding of a spider web coil, shows what one is simple inductance this coil is to construct, and it should appeal to the amateur who requires a highly efficient inductance of small size. Figure 3 gives the circuit wiring for a three-coil spider web inductance.

A good way to plot the discs is to draw them first on stout drawing paper and use the drawings as a template to cut the discs out. If they are not exactly circular it does not matter, as it makes no difference if a straight line is run from one slot to another, instead of preserving the circular shape.

The Bakelite discs should be marked out with a sharp steel point—a hat-pin will serve the purpose.

When you first use this type of inductance place the coils close together, turn on the filament current and adjust the variable condenser until you get the signals. Then move the coils slowly away from the fixed primary coil, first the secondary and next the tickler, until you have the maximum signal. When the two coils are away from the fixed primary the shortest wave lengths are received, if all three are brought close together the longest wave lengths come in. The variable condenser in the aerial circuit will give fine tuning and complete control of the circuit.

The same type of wooden stand mounting may be used for a crystal detector circuit, in which case the tickler coil would be omitted. It

will be well, however, to provide for the mounting of the third coil so that valve experiments may be carried out later on. The variable condenser should be used in the two-coil circuit for the crystal detector, also.

Figure 3 gives the circuit for the three-coil tuner, and it will be noted that the primary is the fixed coil in the centre, the tickler is on the left, and the secondary on the right.

Fig. 4.—The Spider Web Coil as a Vario-Coupler Secondary.

Figure 4 shows another use to which the spider web coil has been applied. Alfred Crossley, radio engineer with the Bureau of Engineering, United States Navy, has substituted a 40-turn spider web coil for the usual form of secondary coil in a vario-coupler. This gives maximum coupling when the plane of the spider web is parallel to the plane of the cylindrical primary, and minimum when at right angles. It is claimed that this vario-coupler is extremely selective and gives particularly good results with radio-frequency amplification, as it has an electro-static capacity of less than 1 micro-microfarad at zero coupling and 5 micro-microfarads at maximum coupling.

Abbreviations Used in Wireless Signalling

Abbreviation.	Question	Answer or Notice.
PRB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that?	This is .....
QRB	What is your distance?	My distance is.....
QRC	What is your true bearing?	My true bearing is ... degrees.
QRD	Where are you bound for?	I am bound for.....
QRF	Where are you bound from?	I am bound from .....
QRG	What line do you belong to?	I belong to the ... Line.
QRH	What is your wave-length in metres?	My wave-length is ... meters.
QRJ	How many words have you to send?	I have ... words to send.
QRK	How do you receive me?	I am receiving well.
QRL	Are you receiving badly? Shall I send 25?	I am receiving badly. Please send 25.
QRM	Are you being interfered with? for adjustment?	I am being interfered with. For adjustment .....
QRN	Are the atmospherics strong?	Atmospherics are very strong.
QRO	Shall I increase power?	Increase power.
QRP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster.
QRS	Shall I send slower?	Send slower.
QRT	Shall I stop sending?	Stop sending.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready. All right now.
QRW	Are you busy?	I am busy (or, I am busy with ....). Please do not interfere.
QRX	Shall I stand by?	Stand by. I will call you when required.
QRY	What will be my turn?	Your turn will be No .....
QRZ	Are my signals weak?	Your signals are weak.
QSA	Are my signals strong?	Your signals are strong.
QSB	Is my tone bad?	The tone is bad.
QSC	Is my spark bad?	The spark is bad.
QSD	Is my spacing bad?	Your spacing is bad.
QSE	What is your time?	My time is.....
QSF	Is transmission to be in alternate order, or in series?	Transmission will be in alternate order.
QSG		Transmission will be in series of 5 messages.
QSH		Transmission will be in series of 10 messages.
QSJ	What rate shall I collect for?	Collect.....
QSK	Is the last radiogram cancelled?	The last radiogram is cancelled.
QSL	Did you get my receipt?	Please acknowledge.
QSM	What is your true course?	My true course is ..... degrees.
QSN	Are you in communication with land?	I am not in communication with land.
QSO	Are you in communication with any ship or station (or) with ..... ?	I am in communication with ..... (through .....).
QSP	Shall inform ... that you are calling him?	Inform ... that I am calling him.
QSQ	Is ..... calling me?	You are being called by .....
QSR	Will you forward the radiogram?	I will forward the radiogram.
QST	Have you received the general call?	General call to all stations.
QSU	Please call me when you have finished (or at ... o'clock)?	Will call when I have finished.
*QSV	Is public correspondence being handled?	Public correspondence is being handled. Please do not interfere.
QSW	Shall I increase my spark frequency?	Increase your spark frequency.
QSX	Shall I decrease my spark frequency?	Increase your spark frequency.
QSY	Shall I send on a wave-length of ..... metres?	Let us change to the wave-length of ... meters.
QSZ		Send each word twice. I have difficulty in receiving you.
QTA		Cancel the last radiogram.

* Public correspondence is any radio work, official or private, handled on commercial wave-lengths.

When an abbreviation is followed by a mark of interrogation, it refers to the question indicated for that abbreviation.

Sir: I wish to sell my radio set. What would you suggest? MAX.

A.—Take the box, remove all the trimmings, cut a hole in one side, put in two boxes of polish, two brushes and yard cloth. You will then have a first-class shoe-shine box.—Phillips in "N.Y. Globe."

Radio fan claiming he uses his hair for an aerial is probably talking through his hat.—"Valparaiso (Ind.) Messenger."

The humorist who said that with all the static in the air this summer the most popular call would be SVD is no mean student of human nature.

Marriage by wireless is the latest "stunt" in the American radio world.

In the States it is possible to hear a church service on a Sunday—the sermon, the congregational singing and the organ. One can almost hear the money rattling on the collection plate.

Apparatus and Appliances

THE WILLARD "B" BATTERY.

Most of us have avoided a storage "B" battery because of the trouble in charging, and, because having a liquid high-tension battery, was undesirable owing to its liability to spill. All that is overcome in the Willard "B" battery, shown in the illustration. The charging circuit is simply an electrolytic rectifier made up in a battery jar, with lead and aluminium strips half an inch wide and placed in series with the lighting line through a lamp.

The Willard being leak-proof, that part of the objection to storage "B" batteries is overcome; the insulation of the battery is threaded rubber.

* * *

AN AUDIO-FREQUENCY TRANSFORMER FOR RADIOTRONS.

This transformer is rather on the large side and strikes one as an essentially practical piece of apparatus. It is specially manufactured for radiotron valves, but it is probable that

it will perform equally well with any standard valve. The ratio of secondary to primary turns is 9 to 1. Between windings and between core and windings the transformer is tested to withstand 300 volts, and the allowable current is 10 milliamperes. The impedance at 1000 cycles (1 milliampere) is:

Primary with secondary open (approx.) 15,000 ohms.

Primary with secondary shorted (approx.) 650 ohms.

Secondary with primary open (approx.) 1,400,000 ohms.

Secondary with primary shorted (approx.) 43,000 ohms.

This transformer is obtainable at all dealers.

* * *

THE PARAGON VALVE CONTROL UNIT.

This will catch the eye of the experimenter who likes to try out every circuit that comes along. All four

connections of the valve have their own terminals, and a grid leak and grid condenser are provided, but may be readily disconnected if not required. The unit may be used for a detector or as many stages of audio or radio-frequency amplification as may be desired. It is the handiest valve control unit an experimenter could wish to have.

* * *

A NOVELTY RECEIVER.

MANY claim, not without reason, perhaps, that the valve is inferior to the crystal as a detector, and probably many who would still use the crystal with valve amplification are deterred from doing so because of the proclivity of the crystal detector to fail at a critical moment, necessitating a search for another sensitive spot. In the New Systems, Ltd., Crystal Set No. 4, illustrated

herewith, an invention of the Company, the "Eversel" crystal is employed as the detector, and two stages of amplification are provided.

As its name implies, the "Eversel" detector is always ready and the crystal cannot fail. Maximum detection is secured by this set, which means, of course, that the audio-frequency amplification is available to the utmost point of efficiency. It is obtainable at New Systems Telephones, Ltd., 280 Pitt Street, Sydney, and 54 Market Street, Melbourne.

* * *

A SHORT WAVE RADIO-FREQUENCY TRANSFORMER.

Most experimenters fight shy of radio-frequency amplification because of the difficulty in manipulation with

the apparatus hitherto available. The Radio Corporation of America have now brought out a thoroughly satis-

factory and highly efficient radio-frequency transformer that covers a band of wave lengths ranging from 200 meters to 5000 meters. This transformer is known as the U.V. 1114. Another one, U.V. 1716, has a range of 5000 to 20,000 meters, so that, with the two transformers the whole range of wave lengths is provided for. We have personally tested these transformers, and can vouch for the fact that they are all that can be desired. They are the ideal transformers for the Trans-Pacific Tests as their efficiency is greater, if anything, over the lower wave-length range. For DX work three stages of radio-frequency amplification, one detector and one stage of audio-frequency amplification are recommended. When the brass strap is connected to 1 and 2, the range covered is 200 and 500 meters. With this strap disconnected it is 500 to 5000 meters.

* * *

A NEW RADIO KNOB AND DIAL.

This invention does away with the necessity to drill and tap the knob to allow the set screw to be inserted. Very often the thread is stripped, the head of the screw burrs and there is a tendency for the dial to wobble on the shaft. It will be seen that the screw in the centre of the new dial is hollow and split. The con-

denser or variometer spindle is pushed up through the split screw, and when the knob is screwed on, both knob and dial are firmly and squarely attached.

BAKELITE.

It is almost impossible to pick up a radio apparatus manufacturer's catalogue without seeing the words "panel is of Bakelite." This product has become standard in all high-class radio equipment, and is the last word in insulating material. It comes in all thicknesses, in the sheet, and in all the necessary dimensions in rods and tubes. It machines readily, without crack or burr, and takes a superfine polish.

It does not crack or warp with age, and retains its beautiful black permanently. Bakelite has come through the most drastic electrical tests with flying colours. It is therefore the **best ideal** of insulating mediums, and is incorporated in all worth-while radio apparatus.

Messrs. O. H. O'Brien & Nicholl of 37-39 Pitt Street, Sydney, N.S.W. are the firm handling Bakelite products in Australasia, and also carry full stocks of radio equipment, enamel, silk and cotton covered wire in full range of sizes.

What is the Explanation of this?

The following appeared in the "Evening News" of January 20th, 1923. Comment by us would be superfluous:—

PUBLIC DEMONSTRATIONS.

For some time the position regarding the operation and procedure of public demonstrations of radio telephony has been more or less obscure, but a definite ruling has been given, which should set all doubts at rest.

Through the courtesy of Mr. A. W. H. Atkinson, hon. sec. of the Radio Association of Australia (N.S.W. branch), the following is made public:—

Mr. J. Malone, Controller of Wireless, Melbourne.

Radio Association of Aust., N.S.W. branch, 21/12/'22.

Dear Sir,—

I have been directed by the council of the association to ask if you would advise us as to the position of wireless societies in giving public demonstrations of wireless.

A few weeks ago the Illawarra Radio Club, having received your permission, advertised that they were going to give an exhibition of wireless telephony, and thought they had done all that was necessary. To their great surprise they received a message from the Amalgamated Wireless Company, asking why their permission had not been obtained. After some consideration they said they would give their permission on condition that it was announced at the show, which was done.

We should like to know for guidance in future what authority the Amalgamated Wireless has to control any activities in amateur wireless matters.

We thought that, having secured your permission, we had done all that was necessary, and do not understand why the Amalgamated Wireless Co. should raise any objection. All we desire to know is the exact rules and regulations, so that we can instruct the clubs accordingly, and prevent any friction or conflict with any of the authorities.

(Signed),

ARTHUR E. A. ATKINSON,
Hon. Sec.

In reply to this the Controller of Wireless stated on December 28th:—

In reply to your memorandum 21/12/'22, relative to permits for public demonstrations in wireless, I desire to inform you that, in accordance with the wireless telegraphy regulations, which are administered by this department, the permission of the Controller of Wireless is necessary, vide regulation 4 (8), before any demonstration or procedure not covered by the licence is carried out. This is the only authorisation required by the regulations, and can only be given by this department.

(Signed), J. MALONE,
Controller of Wireless.

The Ether

Scientists have formed a theory which assumes that our universe floats in, and is pervaded with, an invisible, extremely elastic fluid.

We do not know its nature. This sea of elastic fluid is not quiescent, it is troubled at all times by vibratory disturbances.

These disturbances vary in characteristics. Some recur at inconceivably short intervals, others recur at longer intervals.

We are able to both create and detect some of them. Our eye detects a few of these vibratory disturbances and we have classified them as "light." Our bodies detect others of these ether disturbances and we have classed them as "heat." A camera will detect still others which neither the body nor the eye will indicate, such as X-rays, etc. There are many groups of disturbances in this elastic fluid—it has been named the ether—which we have not "discovered," but, many years ago a German scientist, Hertz by name, discovered disturbances which produced electrical effects and which could be reproduced by electrical effects. These have been called Hertzian, or electric waves.

In reality they are the same sort of disturbances and, generally, exhibit the same characteristics as all other disturbances. It is this group of electrical disturbances which is used in radio communication. The intervals between these electrical disturbances in the ether vary, as does also their magnitude. Both the magnitude and their intervals are determined by certain factors.

For example, the greater the force used in creating the electric disturbances in the ether, the greater the magnitude of the disturbances, and the greater the electrical dimensions of the machine or system used in the creation of the disturbances, the greater the interval of time between the recurrence.

All of these disturbances travel through the elastic conveying medium at the same rate of speed, which is 300,000,000 metres per second (which equals 186,000 miles, or approximately seven and a-half times round the world).

Knowing that these disturbances travel at a certain rate and knowing that they reach a given point at certain fixed intervals, it is seen at once that in their travels they are spaced a certain distance apart. Therefore, we may find the distance of spacing by dividing their rate of speed by the frequency of their recurrence.

The result will be an expression in metres and this is what is termed "wave length," for the disturbances are undulatory in form, like a wave disturbance on water.

Electrical disturbances in the ether which are of use in radio communication vary in frequency between about 3,000,000 per second and 12,000 per second, or, converting frequency to wave length, from 100 metres in length to 25,000 metres in length. We know of certainty that there are disturbances in the ether of much higher frequency as well as much lower frequency, but we have not yet learned how to use them in radio communication, and we cannot say that they will ever prove useful unless our present limitations are somehow swept away.

Answers to Correspondents

To A. A. McCullagh, Rome Hill, North Queensland: Copies of the Regulations may be obtained from the Commonwealth Offices, Commonwealth Bank Building, Pitt-street Sydney. Price, 1/2

To Hector Fraser (2JC), Tamworth: Thanks for your complimentary letter. It is true that we have been lagging behind in the matter of radio development, but there are healthy signs that we will have the benefits of radio service in the near future. One Sydney firm has already started broadcasting. We will be pleased to receive radio news from your district from time to time.

To F. G. Bathgate, Manly: Thanks for the articles submitted. We are returning them, however, as our own article on the new valve was already set up, and your other articles are not of sufficient general interest.

To G. W. Judd, Adelaide: You are quite right in what you point out in the circuit enclosed with your letter. We would direct your attention to a very practical three valve circuit described in an article in this issue. We will appreciate it if you will send us along news from time to time of the progress of radio in your district. Thanks for your kind remarks on the "Review."

To Mr. Francis G. Miller, Hon. Secretary, Murray Bridge Radio Society, South Australia: Please convey our thanks to your Society for their congratulations on the "Review." We note what you say re new circuits, etc. It will be our endeavor to render the "Review" a compendium of useful and up-to-date information for the benefit of experimenters generally. You are the first club or society to single out the details part of the policy of the "Review," which is to give the fullest constructional details in connection with all circuits published. We have been through the mill ourselves, and know the value to the experimenter of having exact details supplied. We appreciate your Society's tendered support and co-operation. Send us along group photos of societies or clubs, photos and descriptions of individual receiving or transmitting sets, particulars of experiments, etc., and a monthly report of the progress of radio science in your district will be valuable.

Reports, etc., should reach this office about the 5th or 6th of each month.

We have followed the vicissitudes of what you term "the brass pounding game" for some years, and have the fullest sympathy with their aims and aspirations. Our columns are available for reports of the achievements of the amateur devoted to wireless telegraphy, and we believe, with you, that Australian amateurs can bridge as great distances with low-powered valve transmission and radio-frequency amplification reception as are traversed by the American amateurs.

To Mr. W. J. Keogh, Hon. Secretary Leichhardt and District Radio Society: Thanks for your letter. The best advertisement a club or society can have is to publish a group photo of its members. We will be pleased to receive your Society's photo when available. The report you have been good enough to forward is published in this issue.

To Mr. C. H. W. Uppold, Editor, Newcastle and District Radio Club: We note by your letter that it is your club's intention to instal a transmitting set and to "broadcast" radio concerts. Kindly let us know when you start the concerts, in order that we may advise amateurs when to listen in. Please give the time and duration of the concerts, and the wave length on which the transmission is made. We take the opportunity to congratulate your club on its recognition of the fact that the best service club members can have is something to listen in for, and to test their sets and circuits on. The report is published in this number.

ELECTRICAL SECTION

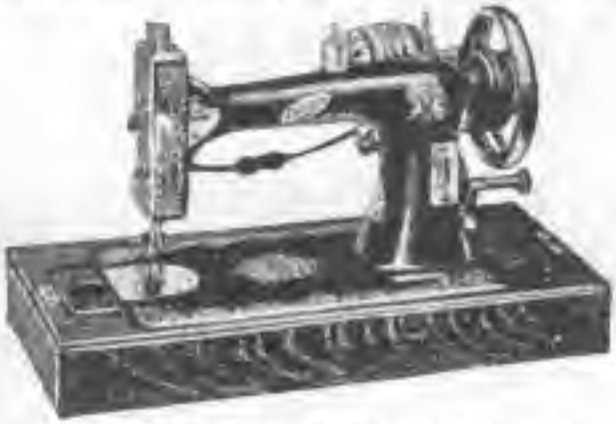
Do we make as much use of Electricity as we should?

Why not save labor in the Home as well as in Office, Shop and Factory?

THE coming of the radio boom in the United States brought with it an enormously increased demand for all kinds of electrical goods. Many thousands of people who purchased radio outfits for correct reception, and who have never given two thoughts to

"Economising a Pleasure."

anything pertaining to electricity before, learned amongst other things, that they needed an "A" battery, and a "B" battery, to operate their sets. They



"Making the Treadmill a Thing of the Past."

learned something about "storage batteries" and "dry cell" batteries, and about the necessity to charge batteries. Many of them had never entered an electrical store in their lives and, when they went along to buy their batteries, etc., they were more or less astonished to find that electricity was not only applied to the lighting of streets or houses, or used for driving machinery, but that it had been pressed into service for the home in a thousand and one ways.

With them, the first point of salesmanship had been achieved—their curiosity had been aroused—and the next two points—enquiry and demonstration—followed as a matter of course.

Now when the three points, interest, enquiry, and demonstration, have been reached and passed—a sale is not complete, but it is very nearly so, in most cases; at any rate, it is safe to say that a sale is not possible without these points having been gained.

Electric Cooking in the Country.

This month we are adding four pages to the Review to allow space for an electrical section in order that we may keep our readers informed as to what is available in electrical service.

If in this way we create the interest, enquiry will naturally follow, and it is then for the electrical goods dealers to provide the demonstration for the enquirers.

We want to see an electrical goods boom, as well as a radio boom, because electricity is capable of service to mankind in a variety of ways, which will tend to increase his comfort, convenience, health and

happiness. Electricity is no longer merely a man's servant, rendering him invaluable aid in industry and business, but it has been brought to the service of woman, lightening domestic drudgery and furnishing the most docile and unsmudgeable help it is possible to have in the home. Equip a home with electrical conveniences and the servant problem is very largely solved. Where no servant is kept, electricity is still more valuable as a help, as it reduces the necessarily monotonous daily routine to the minimum of inconvenience.

Take, for instance, an electrical washing machine. A flexible hose is used to fill the copper receptacle. The clothes are put in and an electric motor turns the washing machinery. After a certain time of washing, a gas burner is lit under the copper and the clothes are boiled. An electrically driven wringer then squeezes out the soiled water, feeding the clothes into the rinsing and bluing tubs at the same time. The washing machine is then backed up to the bluing tub, easy running casters facilitating this operation, the wringer is reversed and the clothes are fed, over a tray, into the clothes basket ready for hanging out. The only labor required is when the clothes are being put through the electric wringer, the heavy, back-breaking labour of hand rubbing and hand wringing being entirely done away with. Our illustration shows a typical electrical washing machine, and it should be noted that these machines will not injure the most delicate of fabrics.

When the clothes are dry they can be mangled with electrically heated and driven hot rollers, or ironed with an electric iron, which retains full heat throughout the ironing and emits no nauseating fumes, nor has it any dangerous spirit burning attachment. Under these circumstances, washing day loses all its terrors, and clothes are not ruined by being bleached in chemical compounds.

Another great labor saver for the woman in the home is the electric motor for the sewing machine. This is a device which can be applied in any home, no matter how humble, as the electric motor and a light-running hand machine together cost much less than an ordinary treadle sewing machine of the cabinet type. The electrically driven machine is even as cheap as the ordinary stool type of treadle sewing machine. The other day we saw a sewing machine fitted with an electric motor and on a neat little table that cost, retail, £14. Why pay as much (or more) for an old-fashioned foot driven type of sewing machine?

"Everything Piping Hot for Breakfast Without Having to Leave the Table."

One big advantage of the electric machine is that it may be readily carried to any room of the house, it is so light.

In the photo, the electric motor will be seen at the back of the machine, well out of way of the sewing. A cord and plug enable the current to be brought from any light socket, and another cord attached to a foot switch, provides stop, and start, and a variety of speeds from the very slowest to the fastest likely to be required, so that the whole control of the electric machine is done by the foot, leaving both hands free to manipulate the sewing. At first, many ladies view the electric sewing machine with some prejudice, but once they experience what quantity of sewing they can get through in a day, without feeling the least fatigued, they become ready converts to this type of domestic help. There is another and very vital matter to be considered in connection with the electric sewing machine, that is the matter of woman's health.

Radio Club Activities

Will Club Secretaries please note that monthly club reports should be at this office not later than the 6th of each month? Photos of club groups should be in as early as possible before that date.

The monthly summary should contain brief particulars of the lectures delivered each week, with the names of the lecturers; particulars as to apparatus installed by the club, and whether transmitting is being carried on, at what wave length, and when. We would like to have reports from all over Australasia, to keep everybody informed as to what is going on in wireless everywhere.

THE Newcastle and District Radio Club is an exceedingly live and wealthy organisation. There are now over 60 members, and numbers are joining up at every meeting. The club meets each Wednesday evening at 8 p.m., in the club rooms at 25 Wiseship-street, Hamilton. A strong committee of 10 members attends to the working details of the club, and they have lost no time in making the club programme attractive to enthusiastic experimenters.

On January 16th the club held an exhibition of wireless apparatus made by members, and there were some very meritorious exhibits.

From time to time lectures are given, the last one being on volt and ammeters, by Mr. Stanfield, who provided a very interesting evening's instruction.

People outside the club are taking an intense interest in it, and a Mr. Jerome has made a voluntary donation to the funds, whilst Mr. Pogonoski printed advertisement cards and gave them as another donation.

An aerial has been erected of the inverted "L" type, twin wire, and 170 feet long by 50 feet high. Radio apparatus is being installed in the club rooms. In the meantime, Mr. Metham, a member, has loaned a valve receiving set. Application has been made for a transmitting license, and it is the club's intention to send out radio concerts for the benefit of members and others.

Details for our report were furnished by Mr. C. H. W. Uppold, Editor, Newcastle and District Radio Club, and his address is Merewether-street, Merewether. (Please advise us when the radio concerts begin.)

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LEICHHARDT AND DISTRICT RADIO SOCIETY.

THE Leichhardt and District Radio Society commenced its New Year activities by holding its fourth business and twelfth general meeting in the new club room, Victory Hall, in the rear of the Methodist Church, Johnston-street, Annandale, on Jan. 9th. After the formal business had been dealt with, members were introduced to Mr. Arthur E. H. Atkinson, Secretary of the recently-formed Radio Association of Australia. This gentleman had attended the meeting of the Society for the purpose of setting out in detail the work, objects, and general activities which his Association had in view. Mr. Atkinson came well supplied with information; he was given an excellent hearing, and received a hearty vote of thanks at the conclusion of his remarks.

January 16th meeting was an informal one, the evening being spent in Morse practice and a general discussion on Wireless matters.

On Tuesday evening, January 23rd the Society had another visitor in the person of Mr. Malcolm Perry, Chairman of the Trans-Pacific Organisation Committee. Mr. Perry went into the matter of the Tests very thoroughly, and it was agreed by all that the Trans-Pacific Tests offered the amateur experimenters a golden opportunity.

On January 30th, Mr. W. J. Zech, Hon. Secretary of the Society, gave a lecture on the interesting subject of Inductance. This was followed by a discussion on the erection of an aerial on the club room premises, and some useful suggestions were put forward and adopted.

CLUB DOINGS IN BRIEF.

THE Kurnell and District Radio Society held their last meeting at the Memorial Hall, Chatswood. A key and buzzer were provided for members wishing to practise Morse. The Secretary is Mr. R. B. Wiltshire, Help-street, Chatswood.

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The North Sydney Radio Club recently compiled the syllabus for the month. An attractive programme

was arranged, including an interesting lecture on C.W. transmitters by Mr. G. McClure.

Meetings are on Tuesday nights and prospective members are cordially invited to attend.

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A club is being formed for Drummoyne and District, and all interested are invited to attend meetings. Enquiries may be made of Mr. Mellor, Fire Station, Lyons-road, Drummoyne, or Mr. R. W. J. Guthrie, 283 Bridge-street, Drummoyne.

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The Illawarra Radio Club meets at the club room, 75 Montgomery street, Kogarah on Tuesdays. The Secretary, Mr. W. D. Graham, of 44 Cameron-street, Rockdale, will be pleased to meet anyone desiring to join the club. At a recent meeting Mr. Gormon spoke on the work carried out by the Trans-Pacific Tests Organisation Committee, and many points of interest were explained.

The club's single valve receiving set will shortly be installed, and an application has been forwarded for a receiving and transmitting license.

The Western Suburbs Amateur Wireless Association have erected a 55 feet mast. This carries a single wire aerial, 140 feet long, but it has been found that this aerial is not much additional advantage as compared with the old one of about 80 feet long. There was a noticeable improvement in short wave reception, but the long waves come in equally well with either aerial. Some very interesting lectures have been delivered, including one by Mr. Challenger on resonance, who also demonstrated high frequency currents with Geisler tubes. Some transmitting has been done, but a better result is expected with a new aerial shortly to be erected.

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The Marrickville and District Radio Club meets every Monday evening, at 8 o'clock, at the Congregational School Hall, Perry-street, Marrickville. The address of the Secretary is 40 Park-road, Marrickville, and he will be pleased to welcome anyone desiring to join the club. At the last meeting a very able lecture on symbols as applied to wireless was given by Mr. R. G. Ellis, Hon. Secretary. Buzzer practice is provided for those desiring to learn the code.

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The Metropolitan Radio Club presents an attractive programme for its members. Lectures are given from time to time for the information of experimenters, one by Mr. P. C. Jones and another by Mr. S. Atkinson being particularly instructive.

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The Balmain District Radio Society is making good progress, and has elected Dr. Stopford as its President. In this the Society is very fortunate, as Dr. Stopford knows does a thing by halves, and is a man of initiative and action.

The Committee is made up of men of practical experience, the benefit of whose knowledge the experimenter should avail himself of. Long distance signal reception practice has been done very successfully. A transmitting license has been applied for, and when transmission is in full swing, members will have plenty of opportunity of trying out their receiving sets. The address of the Hon. Secretary is 17 Grove-street, Balmain, who will be pleased to interview anyone interested in the Society.

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The Camasie and District Radio Club are enrolling new members very rapidly. The club has two lady members, and it would like to see others take an interest in the science. At present the receiving set is a crystal set, and a valve set is shortly to be installed. A twin wire inverted "L" aerial is to be erected. The Hon. Secretary is Mr. W. Hughes, "Loch Vennachar," Evaline-street, Campsie.

Our Monthly Photographic Competition

Very many Wireless Experimenters are also photographic enthusiasts: others have amateur photographer friends who will co-operate with them in sending in exhibits for the monthly competitions of

"The Australasian Wireless Review"

Every month we offer a prize of ONE GUINEA for the best photo of an amateur wireless set in any part of Australasia. TEN SHILLINGS AND SIXPENCE will be paid for the SECOND BEST, and FIVE SHILLINGS for the THIRD. A SPECIAL PRIZE OF TEN SHILLINGS AND SIXPENCE will be awarded for the best radio novelty photograph.
The prizes to be awarded for the best Wireless Sets may be won by those possessing any kind of Set, Crystal or Valve; efficiency, neatness of workmanship and quality of photograph, being the leading factors to be taken into account.

The PRIZE of 10/6 for the NOVELTY PHOTOGRAPH will be awarded for the best photograph of any novel picture or scene in which a radio receiving apparatus is used. Pretty garden party scenes, children listening in, animals hearing radio concerts, &c., suggest themselves as amongst the suitable subjects.
A full description of the competing set to be forwarded, together with wiring diagram of same if possible.

Full names of people, and full description of the photo appearing in novelty photos section is desirable.

All photographs to be the property of the Proprietors of The Australasian Wireless Review. The Editor's decision to be final.

Photos may be sent in at any time, and all the photos to hand by the first of each month will be included in the following month's REVIEW COMPETITION.

Here is the opportunity to win a guinea, half a guinea, five shillings, or the special prize of half a guinea, and at the same time to let your fellow experimenters know what you are doing in your section of Australasia.

Send your photo in To-day! *Do not Delay!*

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